THE AMERICAN
JOURNAL OF PSYCHOLOGY

Founded by G. STANLEY HALL in 1887.

VOL. XV. JULY, 1904. No. 3.

A PRELIMINARY STUDY OF THE PSYCHOLOGY OF THE ENGLISH SPARROW.

(From the Psychological Laboratory of Indiana University.)

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The present study was begun in the autumn of 1901 at the suggestion of Professor Ernest H. Lindley.[1] Since that time the study has come to include a comparative study of the English Sparrow with other birds, especially closely related species —this comparative study to be both psychological and neurological. Although something has been done in the study of other species and on the brain of the English Sparrow, the present paper will deal almost exclusively with the psychology of this bird.

There are many reasons for making the present study. First, the mental life of mature birds has not yet been very thoroughly investigated. The work of Professors Morgan, Mills, Thorndike and others with young birds has brought out some facts that are also half true for adult birds, and Hachet-Souplet, in his training of "pigeons, some of the Gallinæ, sparrows, etc.," has shown how easily and rapidly associations may be established and habits of reaction formed.[2] But no one has made a

[1] I am also indebted to Dr. Lindley for help throughout in devising of experiments and in the interpretation of results; to Professor J. A. Bergström for his sympathy and helpful suggestions. Also to Professor E. C. Sanford for helpful advice in the final preparation of the manuscript, and to Mr. Louis N. Wilson for his kind help in securing the necessary references.

[2] Hachet-Souplet: Examen psychologique des Animaux, p. 37; also Le Dressage des Animaux, pp. 192-194.

study of the psychical life of mature birds which shows the full range of their ability to profit by experience, to discriminate, to inhibit useless actions and reinforce useful ones.

Secondly, something should be done to determine whether the English Sparrow is more intelligent than other birds which he has driven out; to explain to what it is due that he has made such a signal success in adapting himself to the new conditions in the forty years which have elapsed since the first English Sparrows were imported into the United States.

It is surprising how rapidly this bird came into prominence in an economic and scientific way. In 1879 Dr. Coues, in an article which had for its main motive the prevention of the further spread of this bird into the Western Territories, gave a bibliography of 210 different articles on the sparrow written since 1867. This great interest was also attested by the fact that Dr. C. Hart Merriam made it the subject of the first Bulletin issued by the Division of Mammalogy and Entomology of the Department of Agriculture, under the title of "The English Sparrow in its Relation to Agriculture."[1] This large and splendid monograph was based on answers received to a set of questions sent out from Washington and on scientific investigations wherever possible. The great majority of persons answering the questions agreed that the English Sparrow drives out most other birds, often those much larger than himself, and that he has few successful enemies; even cats succeed in killing very few of either the old or the young. Recent observations go to show that the English Sparrow exhibits a relatively wide range of adaptability in the choice of nesting places. According to a very competent observer they now use the holes in banks in the West made by Cliff Swallows, and I have seen a male sparrow do his best to persuade a female that a hole in an electric-light pole was the very best place for a nest. They also apparently live very peaceably with Pigeons in the houses of the latter and another observer has reported to me that he observed a fight between a Red-headed Woodpecker and a Sparrow in which the former was driven away even after he had gone down into what may very well have been his nest and pulled the sparrow out by the feathers of the head.

Mr. Will T. Hill[2] and Mr. Otto Widman,[3] both of whose articles Dr. Merriam gives in full, have something to say of the English Sparrow's intelligence and would most fully, I think,

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[1] Prepared under the direction of Dr. C. Hart Merriam by Walter B. Barrows.

[2] Will T. Hill: American Field, Jan. 14, 1888.

[3] Otto Widman: History of the House Sparrow, *Passer Domesticus*, and the European Tree Sparrow, *Passer Montanus*, at St. Louis, Mo., pp. 191-194, of Bulletin No. 1 of U. S. Dept. of Agriculture cited above.

agree with Brehm who writes as follows: "It is characteristic of the Sparrow that wherever he goes he lives in the most intimate relations with man. . . . Well gifted mentally he has acquired little by little a knowledge of man and his customs. Everywhere and under all circumstances he controls his actions in obtaining his food in the most exact manner. Accordingly he is an entirely different bird in the city from what he is in the country, where he is careless, trustful, and obtrusive. But where he must suffer the consequences he is cautious, sly, and always cunning. Nothing that may be useful or harmful to him escapes his sharp glance. His rules of action based on his own experience last him from year to year and this may be used to recognize the old from the young as the wise from the foolish. As with man he lives also with other animals in a more or less friendly relation, trusting the dog, forcing himself on the horse, warning his fellows and other birds of the approach of the cat, stealing from the chickens, . . ."[1]

And Mr. Hill, of Indianapolis, Indiana, who has kindly furnished me with most of my birds and who has made it his sole business since 1887 to catch the English Sparrow for trap-shooting, says in a letter of recent date, "The English Sparrow has an intelligence peculiar to itself. Being only where man and man's works are and by familiarity it often displays wonderful judgment in that which is harmful to it and that which is not. I think it is the most intelligent of all small birds. Almost any bird can be caught by simple methods, but the only successful way to catch sparrows is to cause it to act impulsively before it has time to think twice. 'Intelligent' hardly tells it, he 's too much for me. I once had 63 varieties of native birds in captivity at one time."

"The history of the sparrow begins with the history of man, and there is every reason to believe that this bird was well known to the people of whom we have no written history; certainly frequent mention of it is made in the histories of the earliest civilizations of Europe. The sparrow is repeatedly mentioned by Aristotle and by almost every European writer on natural history who succeeded him."[2] It would be strange if this bird which has lived in such close proximity to man for such a period of time, and has made man, in spite of himself, feed and shelter him, did not show something of the same mental superiority which, for the same reason, is claimed for the dog, rat, horse, and some squirrels.[3]

This very brief statement will suffice to show what was in

[1] Brehm: Theirleben, Zweite Abtheilung. Vögel. Zweiter Band. pp. 314-315.
[2] Merriam & Barrows: *op. cit.*, p. 301.
[3] Wesley Mills: Animal Intelligence, p. 74.

mind in beginning the present study, and I hope to be able later, in connection with the comparative study proper, to describe more fully the English Sparrow as he is in real life.

Observations and Experiments on Free Sparrows: Method of Approaching Food.

My first step was to study the way in which English Sparrows approach their food. Dr. Lindley had noted many times that they first alighted some distance away from it and approached gradually by short hops. On observing I noted the same thing. To obtain some quantitative expression for this, I laid off in a back yard a plot twenty feet square, and divided it into one hundred smaller squares, two feet each way. In the centre was marked off a square one foot each way. In this I placed the food. The strips of cloth used to mark off the squares were of a brown color, as nearly as possible the same as that of the soil and dead grass. My place of hiding was some fifteen feet away. They were frequently disturbed, but returned readily and I was enabled to repeat my observations as long as I wished. The food used was a mixture, half-and-half of cracked wheat and corn. I first put out food on November 14 at 6.30 A.M. All the observations were made about this time on following days. The birds did not find the food until the fourth day when I made it more conspicuous by placing with it some soaked bread. Then it was only a few minutes until they began to come. I held in my hand a reduced plot (3/8 of an inch to the foot) and placed a dot to mark the place of alighting of each sparrow. I watched for fifteen minutes each morning. The number of different birds was rather difficult to obtain, but ranged from three to fifteen. The number increased as the experiment progressed, except for the last two or three days. By measuring the distance of each dot from the centre on my reduced plot, getting the average and making the reduction, the following table was obtained:

Date.	No. of Visits to Food.	Average Distance (in inches).
Nov. 17	40	46.5
" 18	23	38.2
" 19	60	34.1
" 20	53	34
" 21	62	21
" 22	46	26.3
" 25	48	22.9
" 26	56	23
" 27	60	20.9
" 28	103	16.4

Date.	No. of Visits to Food.	Average Distance (in inches).
Nov. 29	60	23.7
" 30	85	13.8
Dec. 1	7	13
" 2	25	24.7
" 3	27	21.7

These results show a considerable reduction in the distance at which the birds alight from the food; and yet many of the birds never came to alight directly on the food. My observation since, both in the laboratory and outside, point to the same method of approach. The reduction, however, is somewhat greater than the table shows for the food was spread out over the space in the centre and after becoming accustomed to the place they came in such great numbers and kept changing so rapidly that I could not put down dots fast enough.

I am convinced from the wariness which they showed in so many ways in this experiment, and in my work with them in captivity, that this method of approaching their food is fairly well established, and like the "agoraphobia" of some animals perhaps does not disappear in a short time even when the necessity for it is no longer present.

This experiment showed also the readiness with which English Sparrows learn to associate. They learned to come to the trees and grape-arbor near by as soon as I began to turn a chain-pump, which I did the first few times before putting the food out. They also learned to come in answer to my whistle. On the other hand their wariness was little affected. Once when I had to remove a long pole which leaned over their plot they did not come for quite a while. Why they ceased to come toward the last I do not know unless the stormy weather and snow which came at this time had something to do with it.

Method of Experimentation and Special Precautions.

The general method used was the one common in comparative psychology of requiring the hungry animal to overcome some simple difficulty in order to obtain food. In all the tests an attempt was made not only to get the time measure of the rate and the methods of learning employed, but also to get the number and character of efforts made in each trial. Since the sorts of efforts fell into fairly separate and distinct classes, the attempt has been in a measure successful.

The work on the English Sparrow took much more time than had been expected because of the difficulty of keeping the birds in good condition and yet having them hungry when my time would allow me to experiment with them. Animals generally spend a large part of their waking lives in seeking and eating

food, and since, in a general way, it is accepted that the vital processes in birds are very rapid, it was doubly necessary to guard against extreme hunger. To this end I hardly ever used a condition of hunger greater than would be caused by an overnight fast. Food was usually taken away at eight A. M. and tests were made an hour later, so that except when new experiments were being attempted they were rarely without food for more than two or three hours.

The food given them was a mixture of cracked wheat and corn, soaked bread, and recently bird seed of several different kinds. This, as will be seen from the government reports, is largely the kind of food which these birds eat naturally. They have been well supplied with sand and gravel. At first they were kept in a small basement room, poorly heated and ventilated, where the direct sunlight hardly ever reached them. But recently, and while making the major part of the experiments, they have had an attic room where they got the morning sun and where there was plenty of heat and fresh air. Usually, unless for control tests, the birds had been kept in a small cage for several days or weeks before they were put in the large cage (eight by four by seven feet in size), in which all the experiments were made. They had become pretty well accustomed to their surroundings before they were subjected to any tests.

The apparatus used in the study of the sparrow's methods of learning was a small box with one end and side covered with one-fourth inch wire netting. See Fig. 1. A hole three inches square was cut in the middle of the side covered with wire and a wire door made for this. The door was made heavier by doubling the wire and weighted at the top and the right hand corner, the hinges being on the left. The box was tilted forward slightly so that the door would swing open when the latch, which consisted of a thin strip of brass, had been lifted out of the catch. This catch was at first one-fourth of an inch in height. Food was placed in this small box and this set down in the centre of the large cage. Care was taken to habituate the birds to this small box by leaving the door open and allowing them to feed out of it for a few times. In fact, I found that when the box was put in with the door closed, the bird having never seen the box before, it did not succeed in opening the door in a reasonable length of time. But by allowing the bird to learn where the door is and then closing it, he, of course, had a more limited territory in which to work and soon hit upon the right thing.

In the tests the birds were free to enter the small testing box or not as they chose; there was no compulsion. The same was true of the experiments with the maze to be described

presently. This, I think is an important precaution with the English Sparrow and, in fact, with all birds. It is natural that they should feel confinement in small quarters, and the

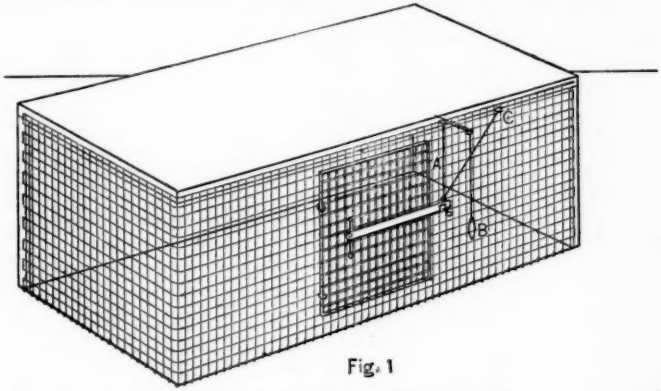

Fig. 1

Sparrow "while adapting himself readily to confinement never becomes reconciled to it." Morgan's exhortation to avoid cramped quarters and extreme hunger in experimenting with animals would seem to be especially applicable here.[1]

For the first series of experiments with the small box described above, a string was fastened to the latch, passed directly upward to a ring at the upper edge of the box, thence out along the wire arm, through a ring on the end of this arm and down some two and a half inches from the side of the cage and a little to the right of the door. See Fig. 1, A.B. A loop was tied in this string at the level of the bird's head. This string was used by the birds in the first series of the experiments only. As there was nothing to prevent them from pecking the latch this was done and this latter method was one used oftener than any other as will be seen in the description of each of the series to be given later.

In later experiments I have attached the string in another way, running it from the latch to a nail driven into the upper edge of the box. See Fig. 1 C. When the bird climbs over the side of the cage he pushes in the string and lifts the latch at its lower end. The door swingsopen as soon as the bird releases the string. One bird learned to push this string in with his head and later with his bill. The last bird, a female, learned to open the door by pushing up the latch, rather than by pecking it.

[1] C. Lloyd Morgan: Animal Behavior, pp. 149 and 151.

The following tables give the results obtained in the experiments described above:

SERIES I.

Exp.	Time.[1]	Sex.
1	6:	?
2	Failed	?
3	"	?
4	9:	?
5	2:	?
6	1:	Female
7	:30	"
8	:30	"
9	:25	"
10	:25	"
11	1:	Male
12	:20	Female
13	:10	"
14	:30	Male
15	:30	"

SERIES II.
(Female.)

Time.	No. of Trials.
3:	?
:45	10
—	3
:30	3
1:	30[2]
:15	6
1:	25
:30	18
:30	11
20:	98[3]
8:	91
3:30	73
:30	8
:25	13
:15	2

SERIES III.
(Female.)

	Time.	No. of Trials.
1	3 —	?
2	Failed	?
3	"	?
4	4:30	?
5	Failed	?
6	4:30	?
7	3:30	9
8	4:15	9
9	5:00	18
10	1:15	4
11	1:30	15
12	:45	4
13	1:15	4
14	:40	3
15	:30	4
16	:45	4
17	:12	6
18	:15	4
19	:05	2
20	:04	2
21	:20	6
22	:20	4
23	:04	2
24	:20	9
25	:25	8
26	1:20	12
27	1:00	1
28	:04	2
29	:15	3
30	:15	3
31	:07	4

[1] In all these tables the time is given in minutes and seconds.
[2] The fastening was made more difficult to work.
[3] The food was taken from immediately behind the latch and placed near the left end of the box.

SERIES IV. (Male.)			SERIES V. (Female.)		SERIES VI. (Male.)			SERIES VII. (Female.)	
No. of Exp.	Time.	No. of Trials.	Time.	No. of Trials.	No. of Exp.	Time.	No of Trials.	Time.	No. of Trials.
1	10:50	?	Failed	?	1	Failed	?	4:30	?
2	10:30	8	"	?	2	"	?	1:04	?
3	2:08	5	20:00	?	3	10:10	8	:55	5
4	1:06	5	3:15	?	4	6:03	5	1:30	1
5	3:00	6	:45	8	5	:30	3	3:00	4
6	:50	5	:15	1	6	:03	1	:25	5
7	:40	3	:05	2	7	:16	3	:15	2
8	2:00	11	:30	12	8	:16	4	1:00	4
9	1:00	4			9	:03	1	:15	1
10	:12	1			10	:35	7	:15	2
11	1:20	7			11	:45	9	:04	2
12	1:00	7			12	:20	3	:37	10
13	:10	2			13	:10	1	:11	6
14	:09	1			14	:03	1	:10	5
15	:06	2			15	:15	2	:58	19
16	:04	1			16	:20	5	:59	8
17	:03	1			17	:35	3	:34	6
18	2:30	3			18	:02	2	:26	14
19	:15	3			19	:09	3	:17	6
20	:15	4			20	:30	8		
21	:15	4			21	:30	5		
22	:10	4			22	:50	2		
23	:12	4			23	:01	1		
24	:05	3			24	:04	1		
25	:04	1			25	:15	1		
26	:09	1-3			26	:04	1		
27	:09	0-4			27	:03	1		
28	:15	-5			28	:40	4		
29	:02	2			29	:40	5		
30	:06	1-3			30	:10	1		
31	:05	2			31	:01	1		
32	:03	1			32	:01	1		
33	:10	1			33	:05	1		
34	:30	1			34	:08	2		
35	:06	2			35	:09	3		
[1]36	3:30	39			36	:02	2		
37	3:40	27			37	:01	2		
38	:05	3			38	:01	1		
39	6:45	21			39	:10	5		
40	1:12	11			40	:03	4		
41	:03	1			41	:02	2		
					42	:01	2		
					43	:02	2		
					44	:15	2		
					45	:06	1		
					46	:15	1		
					47	:02	1		
					48	:03	1		

[1] Here the string was taken off and he had to learn a new way to open the door. The string was replaced for trials 38 and 41.

Series I. As a rule the experiments in this series were made twice each day, once in the forenoon and once in the afternoon. There were five males and two females in the large cage when this experiment was begun. It was quite a while before I could tell certainly which one was opening the door. One of the females died just before the fourth test and the other female was the first to be recognized certainly as the one opening the door. But one of the males succeeds in the eleventh test and he does it in so short a time that it suggests previous experience or unparalleled imitation. He profits by it, too, for he opens the door very promptly in the fourteenth and fifteenth experiments. The female operated from the right side of the string and the male in much the same way from the left. I feel pretty certain that what he did in the eleventh trial was his first effort. Of the possibility of imitation I shall speak later. In this series the door was opened by catching the suspended string in the claws and pulling it in and down, thus lifting the latch. This required not a little skill as the bird must hop out from the upper edge of the box, turn partly round and catch the string in its claws. At the ninth test in this series there occurred the most skillful thing observed in the whole study. The female started from the perch in the large cage some five feet above and four feet away from the small box. She attempted to catch the string in her claws as she flew past the top of the box. But she struck the floor some three feet beyond, flew directly back, and this time succeeded in catching the string. In the seventh trial and most of the following trials of this series, there was wheat and corn on the floor outside the box to be opened; but as a rule the food inside had a greater attraction because it was made more conspicuous by placing soaked bread there in addition.

Series II. In this series the tests were made twice daily as in Series I. There were two birds, a male and a female, in the large cage. The male opened the door first in one minute by pecking the latch. However, the next time the female opened the door in the time given under 1 in the table, and continued to do so. In the table will be found the number of trials made as well as the time taken for the animal to get inside the box. In this table it will be seen that the number of trials in the fifth test increases suddenly from three to thirty. This was caused by fixing the latch. The change made it more difficult to raise the latter above the little wire catch. But this increased number is reduced in much the same way as is shown in all the trials. At the tenth experiment in this series, I happened to place the food, which was soaked bread in this case, near the end of the box covered with wire. This so attracted the bird away from the latch that, by counting the efforts made

alternately on the wire at the end and near the door, I succeeded in getting an experiment in Interference and the following quantitative expression for it:

No. of Exp.	Trials Near the Food.	Trials at the Latch.
1	87	11
2	13	
		9
	10	
		7
	11	
		4
	20	
		5
	4	
		3
3		6
	6	
		14
	12	
		8
	7	
		7
	5	
		8
4	0	8
5	0	13
6	0	2

Series III. Here the tests were made four times daily. There were three males and one female in the large cage. The female opened the door by pecking the latch. This table shows very clearly the effects of an over-night interval on the memory. It is seen both in the longer time and the greater number of trials in the ninth as compared with the eighth test, in the thirteenth as compared with the twelfth and in the twenty-first as compared with the twentieth.

Series IV. In this series the tests were usually made three times daily, twice in the forenoon and once in the afternoon. The suspended string as in Series I was used, but as the door was opened by pushing in on the part that extended from the latch to the upper edge of the box, the part that hung down from the wire arm was taken off. The string was tied to a nail and was just long enough to be taut when the latch was in the bottom of the groove made by the wire catch. Any push or pull would lift the latch and thus open the door. There were two males in the large cage at this time and I could distinguish them from the fact that one was brown and the other slightly gray. Brownie succeeded in opening the door first by pushing in the string with his claws. The changes made in his manner of opening the door and the rapid leaving off in the first few

tests of the unnecessary movements made this one of the most valuable of the series. At first he hopped up to the left of the door; on the far end covered with wire; walked along the front side with one foot on the floor and one on the side of the box; and climbed down over the sides from the top. He accidentally struck the right place and the detailed records written immediately after each experiment show that the unnecessary reactions get fewer in number with each successive experiment. In the tenth test he has left off all of them. At about this time he begins to use his bill on the string. Instead of pushing it in with his claws he strikes it with his bill. In the twenty-seventh test he does not cling to the side of the box while striking the string with his bill but pulls the string while standing on the floor. In the thirty-seventh trial the string is removed and he must learn a new way to get in. He does this by striking the latch with his bill and the table shows how rapidly he reduces the number of these and how nicely he is able to discriminate between the box with the string on and the same box without the string. This string was of a very dull color being the common very strong wrapping cord. But he did not seem to hesitate as to what to do and showed the same power of discrimination as the cats experimented with by Dr. Thorndike.

But this change in the method of learning was more valuable for its effect on the other male bird which was in the large cage with B. When the latter was hopping back and forth in the intervals between trials, the other male was following, pecking and running under him. And in the second of this new series he hopped up on the side of the cage much as B. had done. The next time he tried the same thing five times. It was also to be seen that he expected the door to open when B. hopped down after each trial, since he made ready to go in. He still ran under B. and pecked him in succeeding trials, but as B. learned to open the door in a shorter time, and the old fastening was used often, there was less opportunity for imitation. After the forty-first trial B. was found dead. When the box was set in the other male took the right position for opening the door three times. It should be noted that this position was not this bird's habitual way of approaching the box. He, in the beginning of this series, hopped to the top of the box and around it on the floor. Judging from these tests and those in Series I, it would seem probable that sparrows imitate, though just what the nature of this imitation is the data are insufficient to show. Additional experiments should be made in which there is a good opportunity for imitation. Such I think was the case in the above experiment in which the conditions were suddenly changed, but left the bird to be imitated present, with the necessity for the bird doing the imitating to do something as well.

I find that Mr. L. T. Hobhouse has laid down exactly similar conditions when he says: "Thus it would be more likely that one animal would imitate another if both were trying to escape or get food at the same time. Whether under these conditions there might be reflective imitation—imitation based on the perception of another's act and its result to that other—remains uncertain. What has first to be settled is the possibility of a still simpler mutual act—learning by the perception of an event and its consequence—when that consequence directly affects the learner. If an animal sees something done which has the immediate effect of giving it what it wants, then the something done falls within the sphere of interest as above defined. . . . But if (an animal pulls a string) because he has seen it pulled . . . his act appears rather as a practical application of what he has seen. . . . It is quite possible that an animal should get to this point without being capable of the slightly more complex act of applying to himself what another does on his own account."[1]

If imitation is to be found anywhere in animals it seems that the gregarious, quarrelsome, and pugnacious English Sparrow would be one in which we should expect to find it. From the time when the young are able to take care of themselves they go in flocks more or less by themselves. When mating time is over the old ones join these and, as we all know, the English Sparrow is rarely seen alone. The cry of one of his own or another species, as I have often observed, is sufficient to bring all the sparrows within hearing to the spot at once. Such conditions promise much if we can but suit the experiment to the distinctive movement of the animal.

Series V. This series is a short one but has the advantage of being made on a female bird just caught. The tests were made twice daily. In the third trial she opened the door by falling against the string. She made no use whatever of this incident, but opened the door the next time by striking the latch with her bill. This lack of power to profit by results which do not follow immediately from definitely directed efforts has often been noticed in these experiments. This would suggest, probably, that the range of attention in this bird is narrow. The results which fall within this range are readily associated as all the tests go to show. But a result which is removed from the efforts of the animal in either space, time, or otherwise, it does not seem to be able to use with much, if any, profit. The closing records of this bird, as a good many of the others, show the longer time and the greater number of trials caused by an abnormal condition. On the day before the last I was

[1] Hobhouse: Mind in Evolution, pp. 149-151.

almost certain that she would be found dead the next day, and such was the case.

Series VI. Here the experiments were made twice a day until the eleventh trial, and once a day after that. A male and female were in the large cage but the female was removed after the third trial. The male opened the door by pulling the string with his bill. He is the first male to succeed in first learning the thing to be done when there was a female present. Between the twenty-fourth and twenty-fifth trials there was an interval of eight days. In the meantime the bird was caught and the cage moved to another building. The fifteen seconds in the twenty-fifth trial also includes the time which the bird took to pick a grain of wheat out from inside the wire. He really used but little more time than in the preceding trial and he needed to make but one more effort. This only indicates that the Sparrow has a good memory, as later experiments will show also. This series was longer than the others, the tests here being carried on while the color and number tests were being made. These tests often preceded the opening of the food box by only a few minutes. Often there was food on the floor outside the box. Thus we see that a condition of intense hunger is not necessary in the making of these experiments. A few times I tapped my foot on the floor or otherwise started the bird toward the box, after which he continued his chain of reactions and opened the door.

In this connection Mr. Frank C. Bostok's description of the learning of wild animals seems timely. He says: "An animal learns by association. Though it is a common belief, fear is not the reason for his obedience to the trainer's commands. Habit and ignorance are what cause the animal to become an apt pupil in the hands of the trainer. The animal becomes accustomed to the same way of doing the same things at much the same time, and ignorance of his own power keeps him in this state of subjection.

"This habit is developed in the animal by a laborious and patient process. . . No animal is ever allowed to backslide. . . Such is the force of habit that laxity to-day means a desire for laxity to-morrow. . . ." And further Mr. Bostok shows the remarkable force of habit in a lion which, having thrown him down and carried him over to the other trainer was made to let go his hold and forget his anger by the firing of two pistol shots and the trainer throwing his arm around the lion's neck. These were the signals for a change in the regular performance and it worked here through the sheer force of habit, though in quite different conditions.[1]

[1] The Training of Wild Animals, pp. 120, 152, 158 and 159.

The first part of Series VI, perhaps, shows the effect of an over-night interval.

Series VII. A female bird was placed in the large cage by herself and tests were made once each day. She first opened the door by lifting the latch with her claws. The door did not swing far open and she had to push it with her bill. Although she used her claws in the second and third trial, in the fourth trial she used the more direct method of pushing the latch up with her bill. This shows clearly that with identical apparatus each bird has its individual way of doing the same thing. After the tenth test I made the catch longer so that she must lift the latch one half inch instead of only a quarter. This did not seem to trouble her the next time; but after that it seemed to do so. She struck the latch now instead of pushing it up.

The following are some of the conclusions concerning the methods of learning of the English Sparrow: first

(1) The rate of learning is *at first* very rapid.

(2) The great decrease in amount of time required consists largely in locating the part to be worked upon and therefore in the leaving off of unnecessary movements.

(3) Later the gain in time is due to making the necessary movements more rapidly and accurately.

(4) The first opening of the door is due to happy accident; the bird often not being aware at the time of what it has done.

(5) There is no sign of reason in the sense of looking forward and of adapting means to an end. But there is certain proof of a very great ability to profit by experience and some evidence of an ability to profit by the experience of others, as shown in imitation.

(6) The habit of getting into the box is very soon formed and once formed is very masterful. As early as the sixth trial there may be food on the floor around the box and yet the bird neglects that and makes the required movement for getting at what is within.

(7) Its habits are nevertheless still plastic and change readily to fit new and changed conditions. It not only readily adapts itself to changes made by the experimenter; but perfects its own adjustments by dropping off what is unnecessary.

(8) The individual differences are very well marked in all the experiments.

The curves below, Figs. 2, 3, and 4, represent the times which were given in three of the foregoing tables, Fig. 2 corresponding to Series III, Fig. 3 to Series IV, and Fig. 4 to Series VI. It was thought unnecessary to represent the shorter tables by curves since they exhibit nothing which is not true of the longer ones. The distances on the ordinates represent time in seconds, and the successive trials are in-

dicated on the abscissa. It should be noted, however, that in Figs. 2 and 4 the first trial in each is really the sixth and

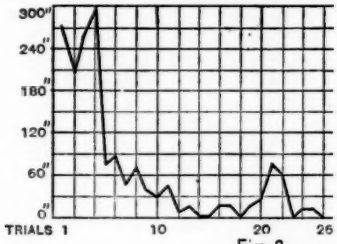

Fig. 2

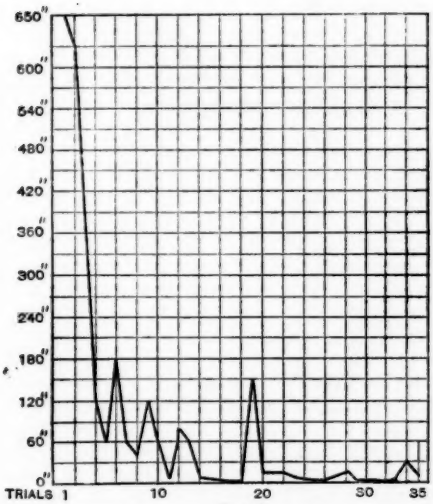

Fig. 3

second in their respective series. If these curves are compared with those of Drs. Thorndike[1] and Kinnaman[2] for the higher animals, including monkeys, although the conditions were not identical, it will be seen that there is a striking similarity in

[1] Edward L. Thorndike: The Mental Life of Monkeys. Psych. Rev. Monograph Supplement, Vol. III, No. 5, p. 11; also Animal Intelligence, Psych. Rev. Monograph Supplement Vol. II, No. 8, pp. 18-36.

[2] A. J. Kinnaman: Mental Life of Two Macacus Rhesus Monkeys in Captivity. *Am. Jour. of Psychology*, Vol. XIII, p. 117.

form. It is necessary that the fastenings used for the birds be very simple. The limitations of the animal's structure will not

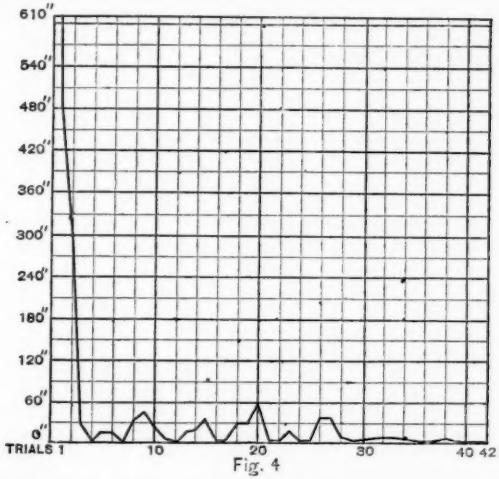

Fig. 4

allow them to be otherwise. Yet the manner of pulling the string in Series I suggests that something more complex and calling for greater nicety of co-ordination would be possible if one should take the time and trouble to work it out. However, the rate at which the "number of efforts" is reduced, as shown in the above tables, is very significant. An animal's "power to profit by experience" is, after all, the best criterion by which to judge of its intelligence. A very stupid animal, if he had a human-like hand would very probably be classed by many as very intelligent. Therefore it seems to me that any animal showing the power of inhibition which is seen in this bird must not be ranked low in the scale of mental capacity simply because of our inability to match its structure and movements with our artificial experiments.

So-called Number Tests.

The attempt made here was to study in the same way as Dr. Kinnaman did with his two monkeys[1] the number sense of the English Sparrow. Ordinary glasses were covered with dark gray paper, of a shade that I found from preliminary tests that the birds were probably the least afraid of. These glasses were placed in holes two and one-half inches apart and large enough

[1] Kinnaman: *op. cit.*, p. 173.

to allow the glasses to extend through the lower edge of the board. The board was three feet and ten inches in length, five inches wide and one inch thick. It was held up off the floor by two cross pieces two inches high. As the glasses expand toward the top there was a distance of only two inches between their upper edges. See Fig. 5.[1]

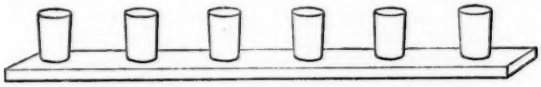

Fig. 5.

About 1,900 experiments each were tried with one male and one female. The male Sparrow was experimented with first, and for him the food was placed in glasses in the following order: 3, 4, 2, 5, 1, and 3 again. The order for the female was 3, 4, 2, 5, 2, 1. When I began these number tests the large cage had but one door and I could use but one end of the cage; but only a few of the first series of experiments were made in this way as I very soon had a second door put in. After this was done I could enter the large cage at one end, pick up the board, carry it to the other end, place it across the large cage anywhere from near the middle to near the end and leave by the door at that end. This kept the bird at the far end of the cage until I could get behind the screen. The food glass was alternately on the bird's right and on his left as he made successive trials from different ends of the cage. A newly papered food glass was substituted often and irregularly, the glasses next to it were changed frequently, and the board turned round; but no change of this kind ever made any difference that I could notice with the birds' selection. Whether the right glass was chosen or not, the birds were allowed to take one bit of food. The experiment of making them do without when they did not alight on the right one was tried, but this only made them miss the more.

The following tables give the results of these tests, the number of correct choices being underscored and the results of each successive series of twenty tests extending from left to right above this line.

The record was kept on a paper ruled into squares corresponding in relative position with the glasses. The glass on which they first alighted was marked a, the next they went to b, etc. I thus obtained not only a record of their selections but also of their sense of direction and position and in some few ex-

[1] This was so nearly like Dr. Kinnaman's apparatus for his color tests that I have here, with his consent, reproduced his figure, though I used ten glasses.

Male.

No. of Glasses.	Food in Three.									Food in Four.												
1																						
2	4		5	12	8	1		1	3	1	2											
3	2	7	8	15	12	6	9	14	16	3	2	3	4	3	3	1	1	1	2	2	2	1
										3	5	6	7	10	7	9	7	9	11	8	7	8	13
4	11	6	1	3	7	17	9	5	9	6	4	8	6	5	10	5	8	5	6	9	9	6	6
5	5	5			2	5	2		2	3	4	3	1	2	2	5	4	5	2	1	2	4	
6	1	2								4	2	1	1										
7											2												
8																							
9																							
10																							

No. of Glasses.	Food in Two.																		
1			1		2	1	2	1	1		1						7	4
2	4	6	6	12	14	17	12	11	12	13	18	13	15	16	13	12	14	
3	6	8	3	6	1	2	5	5	4	2		2	6	3	5	1	1	
4	5	7	3	2	2				2	2		4	1	3			1	
5	4				1		1	2	1	3	1							
6	1		1					1										
7												1						
8																		
9																		
10																		

No. of Glasses.	Food in Five.																	
1			1			1												
2	6	3	2	3	2	3	1											
3	6	4	8	6	1	3	1					2						
4	2	7	1	1	2	6	5	5	3	6	5	9	4	5	6	6	5	4
5	2	3	2	2	8	7	6	8	12	12	9	8	8	13	13	13	7	11	12
6	4	2	4	7	4	2	1	5	2	4	4	4	3	3	2	1	6	1	3
7		1	2	1		4			1	1	1	1					1		0
8																			1
9																			
10																			

Male.

No. of Glasses.	Food in Three.									Food in One.							
1										6	9	11	6	5	9	9	9
2			2				3	3	1	7	8	7	9	5	7	9	7
3	0	2	1	4	4	10	6	9	15	6	3	1	3	6	2	2	4
4	7	10	11	13	14	8	6	8	3	1		1	1	3	1		
5	11	6	6	2	2	1	3		1						1		
6	2	2		1		1							1	1	1		
7							1										
8							2										
9																	
10																	

Female.

No. of Glasses.	Food in Three.																
1																	
2	1	1	2	3	3	10	11	1	8	6	1		2	3	4	2	3
3	5	3	9	3	7	10	7	16	9	12	13	12	7	6	5	10	7
4	5	6	7	10	10		1	3	3	2	5	6	9	8	7	7	8
5	4	5	1	2			1				1	2	2	2	4	1	2
6	2	2	1	1													
7	3	1															
8				1													
9		1															
10		1															

No. of Glasses.	Food in Four.															Food in Two.								
1				1																				
2	5															0	4	2	1	0	6	1 3	1 4	3 8
3	1	6	6	3	3	3	7	8	4	3	2	3	1	1		3	5	7	9	5	5	7	5	7 4
4	11	8	10	5	6	4			8	10	7	8	11	12	9	12	12	9	5	6	8	7	8	6	9	8	5
5	1	6		9	7	6	11	11	6	6	7	7	6	6	6	8	5	2	2	1	2	4	1	3	1		3
6	1			3	3	5	2	1	1		4	2	2	1	5		3	5	1	4		4					
7	1		3		1	1			1									1								
8						1																				
9																										
10																										

No. of Glasses.	Food in Five.																						
1																							
2																							
3	2	2	2	1	2		2	6		5	5	1	1	1					1				
4	4	5	5	4	4		2	9	11	6	11	6	5	10	8	8	2	7	6	8	5	7	
5	2	7	4	4	8		9					11	9	2	5	6	11	7	5	7	12	10	
6	4	4	4	6	5	6	5	8	9	4	2	5	7	7	6	7	5	7	5	3	3		
7	5	0	4	5	1	3		1									1	1					
8	2	2	1																				
9	1																						
10																							

No. of Glasses.	Food in Two.																Food in One.									
1												[1] 1	8	4	8	3	0	1	1	6	8	7	7	8	[2] 7	15
2	0	0	3	7	4	5	6	8	3	7	6	8	13	10	13	9	15	0	7	7	4	5	5	3	2	5	5
3	0	7	5	4	5	7	9	7	7	1	9	6	6	1	3	3	2	3	4	6	9	7	8	9	8	8	
4	9	7	4	9	6	8	4	4	10	8	5	5						13	5	3	1			1	2		
5	10	5	5		5		1	1		3		1						3	3	3							
6	1	1	1							0								1									
7			2							1																	
8																											
9																											
10																											

periments with one of them, of their sense of distance as well.

In experiments of this kind it is very important that after the sparrows have learned to feed from one glass, they should not at once be tested with another. Since in that case the older association interferes with the formation of the new. This interference when the series follow each other immediately is evident in the tables above. In the table for the male Four does not show the effect of preceding experiments with Three because there was a rest of some weeks intervening. But Two shows the effect of Four, Five of Two, Three the second time of Five, and one of Three. It will be noticed that with some of these the interference is greater than with others; but for this no reason can now be given. The female showed the same difficulty in breaking away from Four and Five for Two. Judging from both observation and results, I believe that the habit which the sparrow has of alighting some distance from

[1] Here the two end glasses were taken away, the food glass occupying second place still but where four was originally.

[2] Here the food glass was put in the fourth place but still first in the series.

his food makes it difficult by this method of experimentation to get a perfect expression for his ability to sense position in a series. Yet it will be seen by comparing these tables with Dr. Kinnaman's[1] that the birds begin with as high an initial number of correct choices, that with some of the locations they reach the maximum as soon, and that the percentage of correct choices is in many cases greater than for the monkeys. It should be added, however, that the birds were experimented on in smaller quarters than the monkeys and so had some greater opportunity to fix the position of the glass absolutely by associating it with the definite part of the cage. Yet the board was moved endwise and toward and away sufficiently far I think, to prevent any very constant association with a definite position in the cage.

The results show very few effects of the over-night interval, especially after the experiment was well started.

The records show another element which must be considered in interpreting these results. Usually the male bird flew from his perch, which was about eight inches long and at the middle of the farther end of the large cage at a height of about six feet. In fact, I took off the perches which extended the entire length and width of the cage to make him start more nearly from the same place each time. Yet he did not always use these small perches and by keeping a record of the position from which he started I was able to find some relation between his starting point and the glass selected. If, for example, he flew from the upper left hand corner of the cage he nearly always went too far to the right and *vice versa*. Again, if he walked instead of flying he had to get his bearings anew and often made errors. The manner in which both male and female made ready to single out the food glass was a repeated turning of the head in such a way as to run now one eye and then the other along the row of glasses. The male did this a good deal more than the female and I account for his better results largely through this. He was very deliberate, turning his head often as many as ten or twelve times before making his choice. The female was wilder, more impulsive and hence less accurate.

The place of the food glass in the row of glasses must be the thing which is sensed, since when the series were considerably shortened at one end (the food glass remaining second in the series, but standing much nearer the middle of the cage), the female lacked but one of doing as well as with the full series in which she had been practiced. The same change with *One* made no difference at all in the number of correct choices.

It might be added that the male did not do so well with food

[1] Kinnaman: *op. cit.*, p. 177.

in glass number *One* as with the others. Very early in the experiments with food in glass *One* he could get it almost every time when the board was at one end of the large cage and he seems to have simply preferred to alight on *Two* or *Three* and then hop to *One*. He knew where *One* was and often jumped over *Two* to reach *One*. A reason for this failure to fly directly to *One* may be the fact that it being on the end of the board was too near the side of the cage.

Another source of error was created by getting the bird too hungry. He would fly for the food before I was out of sight; and while he was not wild, my having to leave the cage at the corner and still being where he could see me, caused him to swerve too far to one side. This I tried to overcome by driving him back to his perch at once before he reached the food and not counting that time.

Finally, it may very well be asked whether all of these experiments come any nearer to proving that animals (birds in this case) actually count, or "perceive the relations necessary for counting." The method of experimentation does not require anything more than the location of the member of a series or the sensing of the size of a group. If we do not find in birds the power to count we have in their nice sense for the location of a member of a series or for the size of a group something of that preliminary number sense which Ribot describes as belonging to children and savages.[1] As we shall see the sparrow develops in a short time a very strong attachment for place and it is to be expected that this would help him materially here.

It was said above that the method of recording the results in these number tests made it possible to get a record of the birds' sense of direction. The errors in direction such, for example, as going to the left from the food glass when already too far to the left, or going to the right when too far to the right, were as follows: for the female 38 times in 1,840 tests, and for the male 23 in 1,360.

If each series of 20 tests is divided into four groups of five each, the mistakes of the female are distributed as follows:

First five, 42%; second five, 22%; third five, 19%; and the fourth five, 17%; of the male first five, 61%; second five, 8%; third five, 19%; fourth five, 12%. Although there was an average of *fifteen* series of twenty each for each number for the female and *thirteen and three-fifths* series for the male, 34% of the errors in direction for the female and 26% for the male fall in the first series of twenty tests. I give these results simply to show how early in each series, and in the work with each

[1] Ribot: Evolution of General Ideas, p. 35 ff.

number, the birds learned which way to turn in case they did not alight on the glass with the food in it.

Form Tests.

No form tests have been made on the male, and with the female they followed immediately the tests with the food glass in the third place.

The forms were six in number and the size of each was as follows: Hexagonal, 1⅔ inches on each side; triangular, 4⅜ inches; elliptical, 4½ x 2⅜ inches; circular, 3¾ inches in diameter; rectangular, 3½ x 2½ inches; and the square, 2 15-16 inches. See Fig. 6.

Fig. 6

In this respect they were different from the forms used by Dr. Kinnaman with the monkeys as his forms were of different heights as well.[1] These forms used with the birds all have approximately the same capacity. They were made by gluing the one inch poplar boards together and sawing out the box the shape desired in one piece, one-eighth of an inch thick. The bottoms were then fastened in with glue and all were stained black.

The board on which I placed the boxes was the same as that used in the number tests. The food was first placed in the triangular box and kept in this through the whole of the test though the box itself was shifted after each trial to a different place on the board, the place being determined by a programme previously made out. Not only was this food box changed, but the box which the bird alighted on first in each trial was changed also. It was early seen that she could not or did not distinguish the triangular box from the rest and it was thought worth while to see if she would follow the box she alighted on first. Each series consisted of twenty tests. The different forms were tried in the order given in the following table.

It is evident from the results given in the tables below that she showed very little power to distinguish form. She alighted on the 2nd, 3rd, and 4th box from the end of the series, and it made very little difference what the form was. She very rarely followed the food box or any other to a position next to the place it had occupied in the preceding experiment. She succeeded in picking out the right form only when it came to the positions where she was in the habit of alighting, and often she changed

[1] Kinnaman: *op. cit.*, p. 129.

Form Tests. Female Bird.

Box Chosen.	Triangular Box contained food.														Total.
Cir.	1	4	5	3	3	5	6	1	3	4	4	4	3	6	3—55
Sq.	1	1	4	4	3	3	1	4	3	3	3	3	3	1	3—40
Tri.	4	2	2	3	4	2	4	5	4	4	3	5	5	5	3—55
Rect.	5	2	3	2	2	5	2	3	3	2	4	3	2	2	5—45
Hex.	6	5	4	3	5	1	3	4	3	2	3	3	4	1	4—51
Ellip.	3	6	2	5	3	4	3	3	4	5	3	2	3	5	2—53

Box Chosen.	Elliptical Box contained food.								Total.	Rectangular Box contained food.										Total.
Cir.	3	3	2	2	2	4	2	5	3—26	3	4	3	3	3	4	3	3	3	3	3—35
Sq.	2	3	4	3	5	3	4	3	2—29	4	3	4	3	4	4	4	5	3	4	3—42
Tri.	3	4	4	3	3	3	2	3	5—30	3	4	3	3	3	3	4	3	4	2	5—37
Rect.	5	2	3	5	3	3	3	3	2—28	4	6	5	3	3	3	4	4	4	4	4—44
Hex.	4	1	3	4	4	3	2	2	2—25	4	2	2	4	3	3	2	3	3	3	2—31
Ellip.	3	6	4	3	3	4	7	4	6—40	2	1	3	4	4	3	3	2	3	4	3—32

Box Chosen.	Circular Box contained food.								Total.
Cir.	4	5	4	4	4	3	3	4	7—38
Sq.	4	3	5	3	4	3	4	3	3—32
Tri.	2	3	2	3	3	4	3	3	3—26
Rect.	2	3	4	3	3	2	4	3	3—27
Hex.	4	3	3	3	3	3	3	3	1—26
Ellip.	4	3	2	4	3	4	3	4	3—30

from the 3rd to the 4th, or *vice versa*, just in time to miss the right box. Her alighting on the third box first falls into groups as her correct choices in the number tests very often did. The records show that when the form tests were first begun she showed a decided place preference for 2 and 3. This gradually gave way to 3 and 4 and the closing tests show that she had begun on 4 and 5. If she alighted on the third box and found the food-box to her right at 1 she usually turned to the right the next time although the food-box was now to her left at 5. She either did not distinguish or notice the forms, or her associations with place were so firmly fixed that she did not overcome them.

Color Tests.

From the brilliancy and variation in the coloration of birds and from Dr. Thorndike's[1] work on young chicks, perhaps we can rightly infer that birds possess considerable power of color discrimination. It was to obtain some idea of how far this is true of mature birds that the present experiments were made.

The first experiments on color with the Sparrows were de-

[1] Thorndike: The Instinctive Reactions of Young Chicks, Psych. Rev., Vol. VI, pp. 282-291.

signed to show their color preferences. Six shallow dishes some five inches across were covered with the following colored papers—white, yellow, gray, blue, red, dark gray and green. The blue was lighter than the standard blue of the Bradley colors and the green darker than the standard green. There were two birds in the cage during the first series of experiments of this kind and one followed the other most of the time. With both, place seemed to be the determining factor as out of 125 experiments, although the dishes were shifted each time, the bird leading went to the third from the end 54 times, the fourth 48 times, the second 19 times, leaving out the first, fifth, sixth and seventh almost entirely. They showed least fear of the grays and most of the green and yellow. But the fact that stands out here is the strong hold which place has upon them. The bird which followed showed more fear and therefore more choice and when experimented on alone he showed the same preference for place and also a slightly greater preference for the grays, but was rather easily induced to eat from the green dish.

The above experiments were merely preliminary. The experiments proper were made only on the female. These followed immediately after the tests with the same bird on the forms. The same board was used as for the number tests and six of the glasses were covered with the Bradley colored papers —a dark gray, a light gray, a bright yellow, a dark blue, a light green and a dark red. The brightness has not been experimentally determined.

A programme made out previously determined the place of the food-glass as before. Twenty tests were made in each series. The following table gives the result, the colors being tried in the order given:

Female.

Colors.	Food in Blue.					Food in Yellow.									Food in Red.					
Blue,	12	14	13	12	19	16	10	12	14	9		6	3	2	6	6	2	3	1	
Red,	1			1		1									2	1	9	15	14	20
Green,		2	2				2				1		1						1	
Yellow,			2	2			5	1	5	8	16	11	13	18	19	12	9	4	2	1	
Light Gray,	4		3	2	1	2	2	3	1		2	2			1		1	4		1
Dark Gray,	4	4		3		1	1	4		3	1	1	3				3	1		2

Colors.	Food in Green.				
Blue,	1	1	1	2	1
Red,	3		2		1
Green,	9	17	15	14	18
Yellow,	2			2	
Light Gray,		1		1	
Dark Gray,	5	1	2	1	

These results show that the female Sparrow can readily distinguish the colors used. She does quite as well as the female monkey tried by Dr. Kinnaman[1] for blue and green. She did not do so well for red and yellow. This may be partly explained from the fact that she was more afraid of these. Several times during these experiments she manifested the same thing which we notice so often in our own actions after they have been reduced to habit and changes in conditions call for a change in the order of reactions. She would fly to the blue glass and then go directly to yellow, jumping over several others. At the same time she seemed to show surprise at the fact that she had not alighted on the right one. This, of course, was after the color had been experimented with for some time.

Experiments with the Maze.

The maze was made after the plan given by Dr. Small, by whose permission I reproduce it here. See Figure 7, page 340.[2] It was, however, reduced to one-half the size, 3x4 feet. The alleys were made three inches wide and the partitions four inches in height. No pieces of wood were used to support the corners, but the edges of the strips of wire, one-fourth inch mesh, were unraveled and these unraveled wires run through holes in the wood bottom and clinched. At the top and sides the unraveled ends were clinched to the wire mesh. This gave a maze throughout of the same colored wire and of course very free from landmarks. This test is quite likely to be judged as a very artificial one for birds and one that does not call for the exercise of any one of their instinctive or habitual methods of reaction. Yet these birds work their way through the foliage of trees, through the leaves and plants which cover the ground and through crevices and drain-pipes in and about buildings. But granting that the test is an arbitrary one, success in it argues all the more for the intelligence of the Sparrow as we shall see from the results.[3]

The maze was placed in the large cage with food in the centre, which was covered with a wire lid. The bird, of course, came down and spent a good deal of time hopping round on, and pecking through, this lid. At the opening *o* Fig. 7, I had a door of wire which could be closed by a rubber band and

[1] Kinnaman: *op. cit.*, p. 136.

[2] Small: Experimental Study of Mental Processes of the Rat, II, *Am. Jour. Psych.*, Vol. XII, p. 207.

[3] In the cages with bottoms covered with paper it was a great surprise to me to see them crawl round under the paper in search of food, and one has to force them out as he would a mouse when they remain hidden and very quiet under the paper.

which I held open, until the bird had entered, by pulling on a

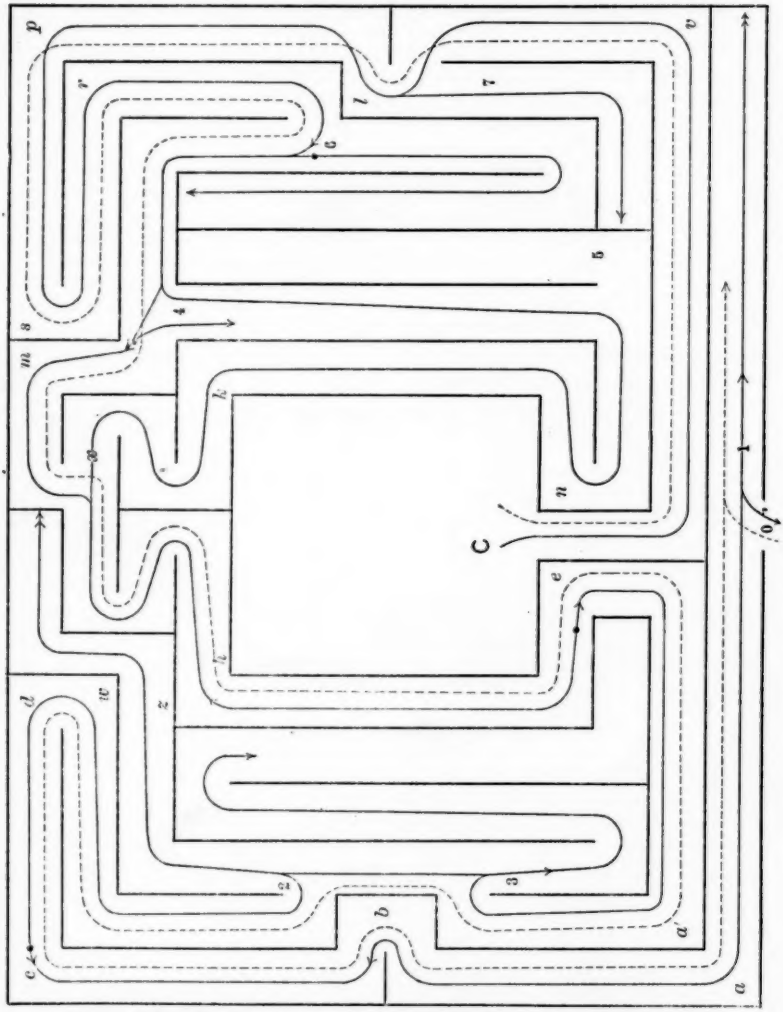

Fig. 7.

strong thread attached to the door and passing through the wire side of the large cage. The loosening of the thread and

allowing this door to close after the bird had entered and the pulling up of the lid over C after the bird had reached the food, nearly always caused some fright and perhaps was in so far objectionable.

In the first experiments I placed a few grains of food just inside *o* to induce the birds to enter. But after their first experience they evidently regarded the maze as a trap, and I have waited sometimes for hours until the bird's hunger should overcome his wariness. I should expect to find such wariness, such inhibition and control, in very few, if any, other birds. This does not mean that the Sparrows did not try the maze to see what it would do. They nearly always in their approach to any new and strange object have the appearance of testing it. They climb down the side of the cage toward the fearful object, fly directly toward it but hover and then away. If they walk toward it, they do not go directly. Their fear is not a senseless one. Some recent comparative experiments would seem to indicate that in some other wild birds *wariness* is less developed.

The time for passing through the maze was taken with a stop-watch as in the tests with the food-box and the number of errors was kept by use of the letters shown in Figure 7. The tests were made once each day and the maze removed from the large cage after each trial. I have succeeded in making tests on one female for seventy-one sucessive days. Also a series of twelve daily trials with another female and nine and six respectively with two males. The general reactions of all the birds toward the maze were pretty much the same. I account for the shorter time with one female by the fact that the others were less habituated to experiment and were much wilder than she was. In fact one of the males was tried with the maze only two days after being captured and he had a broken wing in addition. As will be seen from the table below I succeeded in making only six tests with him and yet he shows the same reduction of time and number of errors as the others. But the wilder birds struggled more to get out of the maze than to get to the food in the centre and were somewhat hindered by their efforts. The same struggling to get out was very pronounced in wild birds tried later with the larger maze which Dr. Small used. His white rats made better records, very probably because they did not spend so much time in trying to get out. The table gives results for the first ten trials with the Sparrows and also for one of Dr. Small's[1] white rats and both of Dr. Kinnaman's monkey's.[2] The numbers represent seconds.

White rat	780	180	240	105	60	90	180	30	60	120
Male monkey,	2700	1800	420	180	900	230	390	285	160	204

[1] Small: *Am. Jour. Psych.*, Vol. XII, pp. 214-218.
[2] *Op. cit.*, p. 187.

Fig. 7.

Female monkey,	3300	7920	840	420	375	450	210	195	165	135
Male sparrow,	3586	1635	893	1424	1072	729				
" "	2502	1697	374	665	72	67	365	210	169	
Female "	3186	457	768	701	326	155	104	72	330	256
" "	810	1305	850	150	70	340	319	140	435	540

The above table shows that the Sparrows are quite as rapid in learning the maze (that is, make as great gain proportionally) as the rats and monkeys. The graphic presentation which follows, Figure 8, shows this somewhat more clearly. The curves are obtained by letting the first times stand for 100 per cent. and computing the succeeding trials in terms of this. One space on the ordinate represents 12½ per cent.; the abscissa shows the successive trials. Only the first ten trials are represented. Curve 1 represents the rate of learning of one white rat, curve 2 the average of the two monkeys and curve 3 the average for three of the Sparrows, one male and the two females. The male Sparrow with only six trials to his credit has been left out of this average. Considered in this proportional way the birds are but little inferior, if at all, to the rats and monkeys; though on the other hand it must not be forgotten that the absolute distance which they had to travel was considerably less. It must be remembered that Dr. Small allowed his rat to spend the night following each trial in the maze and Dr. Kinnaman's trials came one after the other, while the Sparrows were tested but once in every twenty-four hours. Yet, again, judging from the effect of an over-night interval on the birds in the experiments with the food-box, it seems probable that if tried one trial after the other they would have done much better.

In counting the number of errors I included as mistakes the running back and forth in the blind alley marked 3 (and others as well) and have made them have the same standing as to enter 3 and follow it to its end. This, of course, charges the Sparrows with a great many errors which were not charged up against the monkeys at all. So no comparison can be made on the basis of the actual number of errors. Computing the percentages of the errors for the first nine trials, using the first as 100 per cent. and averaging the results for the two monkeys and those for the same three birds used in the curves above, we get the following table:

Sparrows,	100	75	35	27	23	18	15	6
Monkeys,	100	110	245	18	36	12	20	16

Also by using Dr. Kinnaman's[1] table for the averages for both times and errors in groups of ten consecutive trials for the monkeys, and treating my own results in the same way, the following table is obtained:

[1] Kinnaman: *op. cit.* p. 185.

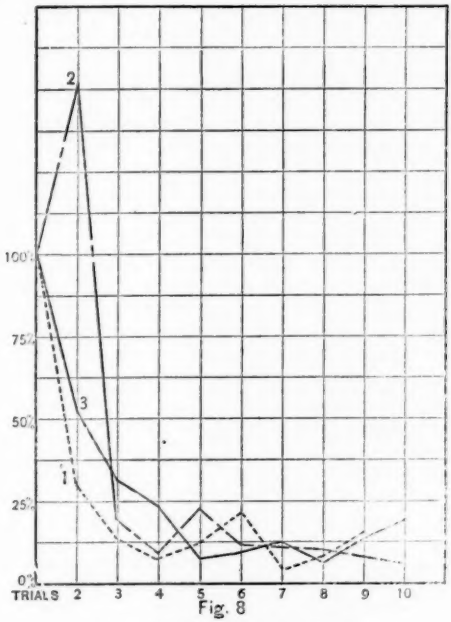

Fig. 8

Average Times in Seconds.

	1st-10.	2nd-10.	3rd-10.	4th-10.	5th-10.	6th-10.	
Male Monkey	726.9	73.7	76.	64.4	61.2	67.2	
Female Monkey,	2579	127.7	63.6	68.1	55.8	55.	
Female Sparrow,	495.9	376.3	48.2	81.4	55.4	33.7[1]	
Average Errors.							
Male Monkey,	18.5	3.1	3.2	2.2	1.4	2.6	1.5
Female Monkey,	14.1	1.3	1.7	.7	.4	.3	
Female Sparrow,	63.9	46.7	1.8	9.2	4.2	1.8	1.3[2]

These tables show in the same way as the tables and the curves above that the Sparrows are quite as intelligent as the monkeys, if ability to profit by experience is taken as a criterion.

The female Sparrow with which I was able to experiment so long went through the maze without a single error on the 23rd

[1] The average of the 1st-10 trials with another female Sparrow is 635.5 seconds; the averages of the 1st-9 and 1st-6 with two males are respectively 680.1 and 1,553.5 seconds.

[2] The average number of errors for the 1st-10 trials with same female Sparrow is 99.1; the averages for the two males are for the 1st-9 and 1st-6 respectively 62.3 and 95 8.

and 24th trials; also on the 27th, 37th, 41st, 44th, 53rd, 56th, 57th, 60th, 64th, 65th, 66th, 67th, 70th, and 71st. The first time of going through perfectly falls midway between that for the monkeys; the male monkey going through without an error on the 36th trial and the female on the 13th.

The English Sparrow never ceases in his efforts to get through or out of the maze. He seldom stops to preen his feathers or to sit down and rest. He is persistency itself. This agrees well with his popular reputation and it certainly seems to me now that the English Sparrow owes much of his biological success to this strenuous characteristic.

The detailed records show that the sparrows with relative ease avoided blind alleys 1, 2, 5, and 7. They get caught at 3 *h-e*, *xkn*, 4 and 6. At first they spend a good deal of time between *he*, *n-k*, and in 3, by trying to get directly to the food. Alley 6 is rather difficult to avoid. They very often check themselves after entering a little way into 3 or any other blind alley. Two of them quickened their pace very perceptibly when about to reach 6 and at the same time were seen to raise themselves more erect and glance toward the entrance to C.

The birds often avoided entering any blind alley as far as 4 or 6 and, if when coming out of these they returned beyond the entrance to 2,3, or any other, they very often entered blind alleys which they had just avoided. At times when the one female tested longer than the others was hungrier than usual she quickened her pace and thus ran into blind alleys which it is reasonable to expect she would have otherwise avoided.

Experiments with Designs.

The female sparrow was tried with something very like Dr. Kinnaman's apparatus 35, and 36.[1] Instead of boxes I used the gray glasses surmounted by cards carrying designs. The food was placed in the glass carrying the card with three horizontal black bars and alongside of this was placed a similar glass carrying a blank card. Next the food was placed in the glass with the card carrying a black diamond, and used as before along with the glass carrying a blank card. In the third series the horizontal bar and the diamond were used, the food being in the glass bearing the diamond-marked card.

Here again the place of the food-glass was irregularly shifted at either end of the cage and while the bird was behind me. Twenty tests were made in each series. If the bird alighted on the wrong glass she was allowed to go to the right one and take one bit of food. The following table shows the number of times she alighted on each glass in these experiments.

[1] Kinnaman: *op. cit.*, G, p. 114.

Horizontal Lines,	14	13	15	14	15	16	16	20	18	17	20
Blank,	6	7	5	1	5	4	4	0	2	3	0
Diamond,	18	14	17	16	17	20					
Blank,	2	6	3	4	3	0					
Diamond,	11	14	12	18	18	20					
Horizontal Lines,	9	6	8	2	2	0					

These figures are remarkable because of the entirely negative results obtained by Dr. Kinnaman with the monkeys.[1] The male monkey chose the right box 154 times and the wrong 146 times, the female monkey chose the wrong 30 times and the right 20 times with essentially similar apparatus. It will be seen from the second part of the above table that the Sparrow under the same conditions chose the right 49 times and the wrong 11 times out of the first 60 trials. The rate with which the bird came to discriminate between the horizontal bars and the diamond seems to show that the Sparrow has somehow come into possession of power of discrimination, at least in this particular, which the monkeys have not. It is probably true, as Dr. Kinnaman suggests in a personal letter to me, that the kind of coloration of food and the color markings of the species in question might enable the experimenter to tell in general beforehand what kind of designs the animals would discriminate.

General Summary.

The following conclusions may be drawn from the facts given in the preceding sections.

1. When tested with food boxes the fastenings of which are suited to the bird's structure, and with the maze, the English Sparrows' rate and method of learning are quite comparable with that of other higher animals. He profits very rapidly by experience.

2. There is some proof of ability to profit by the experience of others, or of imitation. However, before any description of the real nature of this imitation can be given, additional and varied experiments are needed.

3. His method of learning is one of "trial and error." There is no sign of reason or looking ahead and suiting of means to an end.

4. The scope of his attention is probably narrow. Any result of his activity which does not follow closely his definitely directed efforts he seems unable to profit by. He has great power of confining his actions to the matter in hand.

5. His persistency is most striking. Most of the birds tried in the complex maze never rested at all after they were once inside. They also returned again and again to make another attempt to enter the food box.

[1] Kinnaman: *op. cit.*, pp. 119-120.

6. These birds, both in the laboratory and outside, have shown the wariness which is popularly attributed to them. Those kept in the laboratory for months failed to show signs of becoming tamed. They test by various cautious means any new and strange object. Their fear is by no means a senseless one.

7. Although ideo-motor action plays a rather large rôle in their movements, they are able to modify their habits readily. They discriminate small differences in the apparatus and adjust their actions accordingly.

8. An interval of eight days between tests with the food-box on the male showed little, if any, effect on the memory. The results in the maze experiments where the interval was twenty-four hours, and the way these compare with the results on the monkeys tried without any appreciable interval, would seem to indicate that the Sparrow has a relatively good memory.

9. The tests on the "number sense," perhaps suggest that if the Sparrows cannot count, they have a very nice sense of position. Their progress almost parallels that of the monkeys, but they had smaller quarters to work in. The one female tried did not distinguish the forms. This may have been because she was so attached to place, or because she simply failed to notice them. This same female distinguished the standard colors, red, blue, green, and yellow, almost, if not equally, as readily as the female monkey. The designs the female Sparrow learned very early to discriminate, while the monkeys gave entirely negative results with the same apparatus. This may be explained probably by the fact that the black lines and diamond on the white card correspond more nearly with the markings of the Sparrow's food, her mate, and other birds of the same and different species. Such is not at all the case for the monkeys and they may be able to distinguish blotches of color, *i. e.*, markings corresponding more nearly to what they have to deal with in real life.

The biological significance of the mental traits mentioned above for the English Sparrow depends in large part on whether they are distinctive characteristics of this bird. Therefore comparative tests with birds of other species are necessary before an interpretation is attempted.

THE SOUL — A STUDY OF PAST AND PRESENT BELIEFS.

By L. D. Arnett.

II

Psychological Theories of the Soul.

Alger [1] states the following as the psychological arguments for the soul:

(1) All motion implies a dynamic mover, matter is dormant, man is an active power, a free will; so there must be in him an immaterial principle, this is immortal. (2) If we admit the human soul to be material, an ultimate monad, an indivisible atom of mind, it is immortal, defying all forces. The soul as such a unit-consciousness is simple, and its power is an absolute integer. A soul is a simple substance (Herbart) not liable to death but eternal. (3) Indestructibility of soul is a direct influence from ontological characteristics. Reason cannot but embrace the conviction of its perpetuity and its independence of fleshly organization. Our life is best defined as conscious force, our present existence as the correlation of that force with the physical materials of the body and with other forces.

In beginning the chapter it is well to mention that modern psychology questions any use of the word soul, unless the author restricts the term, stating specifically how he desires it to be understood. Lotze uses the word soul but makes the proviso that it be used "future-proof." Ribot [2] objects very strongly to the use of the word and thinks it should be omitted from future psychology altogether. James uses the term in a popular way only, and Dr. Royce [3] says, "If your consciousness is merely based upon an existence, which lies beneath the consciousness and which never comes to light as your own present will and meaning, you gain nothing but a name when this unobserved substratum of your own personality is called your soul." The chief objections urged against the use of the word are (1) that it carries with it the idea of substance, from the metaphysical and theological discussions of the past, and psychologists feel that they have cut loose from this. (2) Ex-

[1] The Doctrine of a Future Life, p. 44.
[2] English Psychology, p. 24.
[3] The World and the Individual, Vol. II, p. 291.

perimental Psychology has tended to create an exact science. Psychologists who have been thus trained do not desire to use a term that ascribes immortality to psychic phenomena, the elements of which they attempt not only to study qualitatively and quantitatively but to establish the underlying principles and laws. Those psychologists can, in fact, discuss "soul" scientifically only as a mental development based on material furnished by the senses.

This section presents some of the ideas of psychologists as to the nature of the soul and attempts to study it from their standpoint. The question that presents itself is, where shall we begin, how shall we distinguish the psychologist from the theologian or philosopher. Külpe [1] distinguishes three periods in the history of psychology.

(1) "In the first, mind, the substrate of all psychical phenomena, is identified with the vital principle. This view carries with it a very broad interpretation of psychology.

(2) "In the second, the province of mind is limited by the definition of 'mental' as that which can be known by internal perception.

(3) "The third makes the psychical coextensive with the subjective."

The view presented in the first period prevailed in antiquity; Aristotle was its most worthy representative. It had certain followers during the Middle Ages. John Locke, he points out, as the first representative of the second period. Other [2] writers regard Descartes as the founder of modern psychology, and early representatives [3] as Hobbes and Spinoza. Ribot notes that in the seventeenth century the science of the soul was called metaphysics, and was so used by Descartes, Malebranch and Leibnitz, Locke and Condillac, and that the word psychology was invented by Goclenius, and later used by Wolf as the title of a work. Certain it is that the writings of Descartes mark a new era, and for the illustrations cited in this study we shall begin with him.

As was noted, earlier writers had not differentiated the psychology of man from that of angels and even God. We find that Descartes considers a number of subjects which class him as a philosopher of that time, but he is also an analytic psychologist. Whatever in the life of the human soul concerns the relation of it to the material world he explains as mechanism. Here Höffding notes that Descartes greatly reduced the number of souls in the universe by his mechanical explanations excluding from the category every form of life below man. Permanent material changes in the brain, when the senses are acted upon, account for the association of ideas; these changes influ-

[1] Introduction to Philosophy, p. 55.
[2] Janet and Seailles: Hist. of the Prob. of Phil., Vol. I, p. 35.
[3] Baldwin Dict. of Phil. and Psy., Vol. II.

ence the subsequent development of ideas. As an extended being, the soul can be in contact with the body only at one point. This point, as is generally known, Descartes thought must be in the brain, and more precisely in the pineal gland. This gland is selected as the central point because, unlike most organs, it is simple, consisting of one part only. In fact it is a central part of the brain. The action of the soul on the body and the body on the soul demands the concourse of God; interaction is not prohibited by the complete unlikeness in nature of the body and the soul. Body, and soul or spirit, represent a dualism of heterogeneous entities, separated in nature by an unfilled interval, the existence of our souls apart from our bodies is inferred. The nature of mind consists in thought, true knowledge in clear and distinct thought. The passions of the soul are related to man as motion to body, they require the union of mind and body, they are the ground of knowledge of soul and body. There is but one body which is united with a mind or animated with a soul and that is the human body, animals are mere machines destitute of mind and soul. The soul is the mind; without self-consciousness there is no thought, mind nor soul. Animals feel, have sensations and impulse, but not self-consciousness.

"I desire[1] you to notice that these functions (animal) follow quite naturally in the machine from the arrangement of its organs, exactly as those of a clock, or other automaton, from that of its weights and wheels; so that we must not conceive or explain them by any other vegetative or sensitive soul, or principle of motion and life, than its blood and its spirits agitated by the heat of the fire which burns continually in the heart, and which is of no other kind than all the fires which are contained in inanimate bodies."

To this arrangement the soul must be created. On this he says: "I had[2] after this described the reasonable soul and shown that it could by no means be educed from the power of matter . . . but that it must be expressly created; and that it is not sufficient that it be lodged in the human body exactly like a pilot in a ship, unless, perhaps, to move its members, but that it is necessary for it to be joined and united more closely to the body, in order to have sensations and appetites similar to ours and thus constitute a real man." The way in which the body and soul are connected through the passions may be gathered from the following:

"The passions[3] cannot be directly excited or removed by the action of our will; but they can indirectly through the representation of those things which are usually joined with the passions we wish to have and which are contrary to those we wish to reject." Although each movement of the gland appears to have been joined by nature to each one of our thoughts since the beginning of our life, it is nevertheless possible, through habit, to join them to other thoughts. "And such is the connection between soul and body that when we have once joined a certain bodily act to a certain thought, the one will in future never occur without the other."

But Descartes maintains that the soul may exist independent of the body: "Since,[4] on the one hand, I have a clear and distinct idea of myself, in so far as I am only a thinking and unextended thing, and as, on the other hand, I possess a distinct idea of body, in so far as it is only an extended and unthinking thing, it is certain that I, that is my mind, by which I am what I am, is entirely and truly distinct from my body and may exist without it." The subject-matter of mediæval philosophy to a great extent influenced Descartes; philosophy and

[1] Treatise on Man. Mahaffy, p. 175.
[2] Discourse on Method, Part V, Tr. by Veitch.
[3] Pass., 45, 50, and 136.
[4] Sixth Meditation.

psychology are yet undifferentiated. Contemporary with Descartes, in England, Hobbes wrote his treatise on philosophy. This work embodied principles of associational psychology. The mental powers are two-fold, cognitive and motive. The cognitive power gives the imagery of external things, this remains after the object is removed. The motive power involves and is dependent on the function of mental representation.[1] Mechanical laws are applied to psychical activities. In sensation the inward motion by way of the sense organ calls forth an outward reaction from the brain or heart, physical motion is thus involved in a psychical process; some trace, for memory, is always left from a sensation. As the vital motion of the heart is helped or hindered there rises pleasure or pain. Appetite or aversion is the endeavor to or from something, based on pleasure or pain. "Will is the last appetite in deliberating." If anything really exists it is and must appear extended; unless it does it is phantasmal. Ideas and volitions are at bottom activities of the body; the immortal soul, and divine mind or spirit, fall in the province of theology. Soul or spirit is either brain action or nerve substance; the spirit is a physical body too refined to escape the senses, as incorporeal it does not exist. For Bacon, and as noted also by Hobbes, certain lines of investigation fall outside the realm of philosophy under the head of theology.

Seailles[2] regards Malebranche as the founder of experimental psychology. His idea in regard to mind and body is that we have a clearer knowledge of our bodies than of our minds. "Although we know the existence of our souls more distinctly than the existence of our own bodies, or of the bodies that surround us, still we have not so perfect a knowledge of the nature of the soul as of the nature of the body." We know the soul through consciousness only, and for this reason imperfectly. "The consciousness which I have of myself informs me that I am, that I think, and desire, and feel, and suffer, etc., but it does not tell me what I am, or the essence of my thought, or of my will, my feelings, my passions, and my pain; nor do I learn through it the ratios between all these things, because again, having no idea of my soul — being unable to see its archetype in the Divine World — I cannot discover by contemplating either what it is, or the modes of which it is capable." The only connection between body and mind is natural and mutual correspondence between the thoughts of the mind and the traces of the brain.

The soul[3] cannot produce nor possess ideas, they are and remain only in God; what we see and know is through Him alone. Malebranche was a follower of Descartes. Locke is regarded as the founder of the empirical method of psychology. According to him the soul is originally like a piece of white and blank paper. There are no innate ideas. All knowledge has its basis in experience; this may be external, taking the form of sensation, or internal as reflection, depending on the place of the object of knowledge, whether it belongs to the world of external sensible objects, or to the internal operations of our mind. The senses convey from external objects into the mind that which, in the latter, is the source of ideas, viz.: sensible qualities. The mind, employed through the ideas already acquired, is the seat of operations, in some of which it is active, in others passive. When the mind considers these activities and states and reflects on them, the understanding receives another set of ideas, which cannot arise from the things without; — such activities are perception, thinking, doubting, believing, reasoning, knowing, and willing. From one of these

[1] Robertson-Hobbes, pp. 123-135.
[2] Janet and Seailles: Hist. of the Prob. of Phil., p. 36.
[3] Fischer: Descartes and His School, pp. 569-77.

two sources spring all our ideas. Previous to the first sensible impression the soul no more thinks than it does subsequently in dreamless sleep. That the soul always thinks is as arbitrary an assertion as that all bodies are continually in motion. The ideas of pleasure or delight, of pain or uneasiness, and of existence, unity, power, and succession are conveyed to the soul both through the senses and through reflection. Qualities are of two kinds: (1) primary — those of bulk, figure, motion, etc.; (2) secondary — those of color, sound, smell, etc. No contradiction is involved in supposing that God has annexed to certain motives, ideas, which bear no resemblance to them. The complex of mental life is the result of experience. Thinking is an activity of the mind as motion is of the body, not its essential characteristic. External objects occasion perception through impressions; the mind is not able to avert this; as a passive organ it is acted upon and fashioned. Locke defines self[1] as "that conscious thinking thing, whatever substance made up of (whether spiritual or material, simple or compound, it matters not), which is sensible or conscious of pleasure and pain, capable of happiness or misery, and so is concerned for itself, as far as that consciousness extends. Thus every one finds, that whilst comprehended under that consciousness, the little finger is as much a part of himself as what is most so. Upon separation of this little finger, should this consciousness go along with the little finger, and leave the rest of the body, it is evident that the little finger would be the person, the same person, and self then would have nothing to do with the rest of the body. As in this case it is the consciousness that goes along with the substance, when one part is separated from another, which makes the same person, and constitutes this inseparable self; so it is in reference to substances remote in time."

Locke's psychology marks an epoch because it attempts to solve the problem of mind from the lower side, as distinguished from explanations of the soul in definite relation to God. Spinoza's logical systematization of the emotions places him in rank as one of the early psychologists. He is a follower of Descartes in many instances. He examines in detail the relations between psychical and physical processes. The mind is[2] part of the infinite intellect of God; and when the statement is made that it perceives this or that, it is affirmed that God has this or that idea, not in so far as He is infinite, but in so far as He is manifested through the nature of the human mind, or constitutes the essence of the human mind. The mind is the idea of the body, *i. e.*, the correlate in thought of body in extension. His definition of emotion is as follows:

"Emotion,[3] which is called passivity of the soul, is a confused idea, whereby the mind affirms concerning its body, or any part thereof, a force for existence, greater or less than before and by the presence of which the mind is determined to think of one thing rather than another." The soul is defined as "thought" or a succession of ideas, or the sum of ideas; the ego does not exist, the relation of the soul to God is impersonal. The mind and the body are one and the same thing, conceived either under the attributes of thought or extension. We do not know how mind acts on the body, but every sensation answers to a bodily condition. The soul can imagine nothing, nor can it recollect anything that is past except while the body exists; it is not only immortal but external. This in brief represents Spinoza's main ideas in regard to the soul, a little in advance of those of Descartes.

Hume[4] followed the views of Berkeley, except in regard to a sepa-

[1] Locke: Human Understanding, II, xxvii, 17.
[2] Ethics, II, 11 cor.
[3] *Ibid:* part III, prop. I.
[4] Bain: Mental Science, p. 205.

rate soul or spirit. By some he is regarded as the founder of association psychology. All notions that express relations of necessity, all supposed cognitions formed on the basis of connections between things, rest, ultimately on the association of ideas. Following Berkeley, he claims that substance is unknown to us—we have no perfect idea of anything but a perception—that is different from substance. If the self[1] or ego existed it would be substantial, hence known. It is nothing but a complex of swiftly succeeding ideas, beneath which an imaginary substrate is supposed to exist named the soul, this latter is an illusion. "It is like a stage, across which feelings, perceptions, thoughts, and volitions are passing while itself does not come into sight." The soul being a complex we cannot truly speak of its immortality. To gain an idea of the psychological aspect of the soul it is necessary to give the leading thoughts of psychologists at different periods, but in this study only a comparatively small number of such can be considered. The one change that has taken place dating from late mediæval times is the gradual release of psychology from the realms, first of theology and later of philosophy, and the tendency more and more to attack the problems from the standpoint of experience and experimental data. The mental content is not considered alone from the standpoint of *a priori* analysis, but, having some knowledge of the sense organs, furnished by a growing knowledge of the body and the development of physiology, the problem is attacked from its lower side, as distinct from the theological view. This method of studying the soul aspects has tended to separate it entirely from its direct relations to God, which it earlier sustained, and identify it with mental processes entirely.

In Germany the release of psychology from the dominance of philosophical systems has taken place more slowly than in other countries. Thus while Kant has rendered a great service in pointing out the lines for an exact study of psychology, he is known better as a philosopher. In his teachings he denied the existence of the soul as a substantial entity that could be known, and the self as object could only be inferred. Using his own expression:

"There[2] does not then exist any rational psychology as a *doctrine* furnishing any addition to our knowledge of ourselves. It is nothing more than a *discipline*, which sets impassible limits to speculative reason in this region of thought, to prevent it, on the one hand, from throwing itself into the arms of a soulless materialism, and, on the other, from losing itself in the mazes of baseless spiritualism. It teaches us to consider this refusal of our reason to give any satisfactory answer to questions which reach beyond the limits of this our human, as a hint to abandon fruitless speculation; and to direct, to a practical use, our knowledge of ourselves—which though applicable only to objects of experience, receives its principles from a higher source, and regulates its procedure as if our destiny reached far beyond the boundaries of experience and life. . . . The unity of consciousness, which lies at the basis of the categories, is considered to be an intuition of the subject as an object; and the category of substance is applied to the intuition." The unity is one in thought, by which no object is given, and to which the category of substance, which always pre-supposes a given tuition, cannot be applied.

In internal intuition there is nothing permanent, for the Ego is but the consciousness of one's thought. The self or soul which we posit back of internal phenomena, is a mere idea, the object of which may be thought as substance, but no intuition can be given, so cannot be

[1] Inquiry Concerning the Human Understanding, Sect. V.
[2] Meiklejohn: Transcend. Dialectic. Book II, chap. I.

known. The subject can never be predicate, and we err when we so arrange it. Empirical psychology is the open road along which to extend our knowledge of the mental life. In brief Kant regarded the soul as an inference. In England the association psychology was early developed. As a representative of this school, J. S. Mill may be taken, although representatives might be selected who state the doctrines of the school equally well. "If[1] we speak of the mind as a series of feelings we are obliged to complete the statement by calling it a series of feelings which is aware of itself as past and future; and we are reduced to the alternative of believing that the mind, or ego, is something different from any series of feelings; or possibilities of them, or of accepting the paradox that something, which *ex hypothesi* is but a series of feelings, can be aware of itself as a series. The opposition of the ego and non-ego, subject and object, spirit and matter, reduces itself to the opposition of sensation considered subjectively and sensation considered objectively." Matter is the permanent possibility of sensation. Our notion of mind is that of something permanent—opposed to the perpetual flux of the states of consciousness, this "permanent" for mind as well as for matter may be only a possibility. Our idea[2] of mind is reduced to nothing more than the idea of a series of actual sensations, and of the infinite possibilities of sensations which may realize themselves under appropriate conditions. The view of mind as a succession of states, an association of ideas, does not invalidate the idea of immortality. "It[3] is as easy to conceive of a succession of sentiments, a thread of consciousness eternally prolonged, as of a spiritual substance which always continues to exist," any arguments in proof are as applicable to the one as the other. This view need have no deleterious effect on one's idea of God. If the Divine Spirit be considered as a series of Divine thoughts (since we infer the Divine nature from the human), prolonged during eternity, then the existence of God is assumed to be as real as one's self.

Coming to more modern writers in Germany, we note the views of Herbart. The[4] soul is a simple substance not only without parts but with no plurality whatever in its quality. The ego is not a unit but a plurality. It is the junction of a series of representations, and is constantly changing its place. It is the result of their combination, their union in a single substance being necessary. It is an unchangeable real[5] and enters into various relations with other reals still conserving its identity. The soul originally was not a representative force, but it became such because it was stimulated to self conservation by other beings. It has its seat in the brain. The simplest representatives are sensations; they serve as symbols of the disturbing reals, and may disappear from consciousness, but not from the soul. For Lotze[6] we may note the following: The co-operation of physical forces is not sufficient to explain the unity which characterizes psychical life, material events of external life cannot cause ready-made sensations or ideas, they can only give signals which the soul must translate into its own language and conversely inner states of the soul are only the occasions for the activity of material organs. The material organs prepare and supply the material for the soul, and on these it exercises its force, thus working in the interest of higher spiritual activities. When the material is given the higher spiritual activities of the soul come into play themselves. Given the different psychical

[1] John S. Mills' Hamilton's Phil., p. 212.
[2] Ribot: English Psychology, p, 118.
[3] Ribot: English Psychology, p. 119.
[4] Lehrbuch zur Psychologie, part 3.
[5] Ribot: German Psy. of To-day, pp. 24-67.
[6] Microcosmus, I, 163-180; II, 135-143.

phenomena, presentation or ideas, these react on the soul and feeling is set free, reactions from feeling on the soul sets free expressions of the will. In the Microcosmus Lotze observes: "The soul neither comes fortuitously to this or that particular body, nor does the body create the soul by its organization; rather are souls a creation of the Infinite, who in this creation, proceeds by a self-given law. Our personality is not, however, compounded of body and soul; rather does our true essence lie exclusively in the soul, and the body is but the most intimately affianced part of the external world, which a higher power has given us as exclusively our own." The spirit is something higher than the soul. In the Spirit is the unity of our being, our true Ego. The soul is but an element in its service. At death the soul passes away, the spirit ripens to a new existence. We turn now in a brief review to the ideas of recent writers.

Recent views of psychology are of much wider scope, wider in the sense that the psychologist is awakening to the fact that, from the empirical standpoint any contribution to the history of the mental development of the race is of great value but it has a wider significance in that it includes careful studies of many forms of animal life as well.

These contribute to an understanding of the development of the mental life. The effort of psychology to free itself especially from metaphysical nomenclature has given rise in recent times to the "new" psychology, a so-called psychology established on a scientific basis and one in many instances without a "soul." Not without a soul in some sense of the word, however, but in it an endeavor is made to avoid the use of the word, and much that it has implied in the past. If there is reference to the soul as has been noted in this section it is, in many instances, prefaced by a limitation of the use of the word. The following modern views are given in brief:

For Wundt: "So long as one considers the soul as an independent atomic whole they are able to grant it an independent existence along with the body, but when we let that metaphysical hypothesis fall, and turn to experience, observation gives us a group of functions, united with definite psychic processes. This latter view grants no independent existence either within or without the body, but we must connect and represent it as unchangeable except with the changes of the bodily existence."—Menschen und Thirseelen, Vol. II, p. 436.

Lewes thus defines his position:

"Together with the present sensation there is always a more or less complex group of revived sensations. . . . . The term soul is the personification of this complex of present and revived feelings, and is the substratum of consciousness (in the general sense), all the particular feelings being its states."—Physical Basis of Mind, p. 414.

For Porter:

Since the time of Descartes "in all the varieties of psychological and physiological theories, those who have held the soul to be spiritual and immortal have almost uniformly and unanimously held that the agent of knowledge and feeling is distinct in essence from the principle of life. G. E. Stahl (1660-1734) 'maintained that the soul was active in the formation and functional processes of the body, as well as in the exercise of the conscious activities,' but he connected with this theory certain extreme doctrines which seemed to be inconsistent with its spirituality and independence of matter, as well as with the plainest facts of experience. Physiology of recent times thus developed, also psychology, favors a theory intermediate between that of Descartes and Stahl, the identity of the vital and spiritual forces. Thus the force or agent which at first originates the bodily organism, and actuates

its functions, at last manifests itself as the soul, in higher forms of activity, viz., knowledgs, feeling, will. The principle of life and of psychical activity is one. Vital phenomena precede the psychical. The energy of the two are proportional, consciousness depends upon unconscious activities. Soul is adapted to the body and acts on matter yet the body is moulded by the soul and manifests it.—Human Intellect, pp. 36-40

Everybody accepts the truth that his soul exists and that it is an immediate substance. The principle that we call soul has the quality of consciousness or self-consciousness; consequently it is an absolute unity, since the substance of its being is extended and divisible it cannot be material.—Dessoir: Geschichte der Neuer Deutschen Psychologie, pp. 151-152.

The following quotations may be given:

"The soul, then, for us is simply our immediate experience, which we take as belonging to a thing that has past and future, in a way just analagous to that in which we construct anything in space and give it identity. We trace our soul backward, and construct it from our given experience. . . . This, then, is the picture of a soul which I have tried to suggest; not a ready-made machine working on certain material, but a growth of material more like a process of crystallization, the material moulding itself according to its own affinities and cohesions."—Bosanquet: Psychol. of the Moral Self, pp. 7-9.

For us the soul is a natural force. It stands in a natural relationship to the body but is not corporeal. It is to be distinguished from blind force as expressed in matter.—Schultze: *Vergleichende Seelen Kunde*, p. 136.

"Psychology is the science of the mind. Instead of appealing to forces that work mysteriously, we can now, since 'soul' has been severed from the material world, introduce a purely mechanical explanation of nature. . . . No one can deny that there are sensations and ideas, feelings and decisions; and in saying that psychology is the science of the mind, we mean by mind, to begin with, nothing more than the sum of all these inner experiences. . . . Concerning the inner relation between mind and matter, we teach nothing; we suppose only that one being works in both."—Höffding: Outlines of Psychology, p. 67.

Sully observes that psychology as a science of mind, "does not discuss the question of the ultimate nature of spiritual activity, or the substance of mind, and the related question of the immortality of the soul." These it hands over to the branch of philosophy known as Rational or Inferential psychology.—The Human Mind, Vol. I, p. 4.

"Psychology may be defined as the science of mental processes. . . . Ideas, feelings, impulses, etc., experienced by me during my life constitute my 'mind.' Mind as used in every-day conversation means much more than this; it means something 'immaterial' or 'spiritual.' . . . It means a something which lies behind the particular manifestation of our mental life, just as the thing seems to lie behind the attributes of the thing. Looked at in this way, however, the term 'mind' takes on metaphysical implications, and therefore has no place in psychology.—Titchener: An Outline of Psychology, p. 5, 9.

"'Subjective' or 'subjectified' processes, facts of 'consciousness,' 'psychical' or 'mental' states will mean for us no more than this—that part or aspect of the experiential fact which is dependent upon the experiencing individual . . . and 'consciousness' itself or 'mind' will in our terminology merely denote the sum total of all these particular phenomena. We shall nowhere discuss anything like a 'transcendental consciousness,' a 'substantial soul,' or an immaterial spirit."—Külpe: Outlines of Psychology, p. 3.

There is an involuntary movement of the mind; this movement is according to a necessary law and implies a nature. "The laws of logic are as necessary, to say the least, as that of gravitation. So, also, in the laws of sensibility, when the considerations are given; and in the various combinations of Intellect and feeling, including animal wants and passions. The force which produces these necessitated movements, is other than that which builds up the physical organization. With modifications it is common to all sensitive and perceptive life, to the animals as well as to us, and though the word has often a different and higher meaning, may be called the Soul.—Hopkins: Outline Study of Man, p. 253.

"By the *mind* or *soul* is meant the thinking principle, that by which I feel, know, and will, and by which my body is animated."

"*Mind* designates the animating principle as the subject of consciousness, while soul refers to it as the root of all forms of vital activity. Spirit is of still narrower extension than mind, indicating properly a being capable of the *higher, rational*, or *intellectual* order of conscious life."—Michael Maher, S. J.: Catholic Philosophy-Psychology, p. 1.

"We do not need a soul separate from our every-day mind, any more than we need two bodies,—one reserved for the State occasions of life. Conscience and ideals must be willing to come close to homely things, must live in touch with our commonest acts, or they may as well be wanting. So that in making no separation of the soul from our most familiar processes, psychology will do the spiritual life no harm."—Stratton: Experimental Psychology and Culture, p. 306.

We have presented the ideas of a number of writers on the subject. What can we gather from a survey of them? If we begin with Descartes, we observe that his mechanical consideration of animal life reduced the number of souls, by refusing to grant that animals have such and recognizing them only in the human race. He did not regard the subject of psychology as a study of mind *per se*, but in order to something else. The dominant interest was not one of psychological analysis. As Ribot[1] observes during the seventeenth century the science of the soul was called metaphysics. Beginning with Bacon and including Hobbes, Locke, Hume and others, the English school in general, the soul was relegated to the field of theology, mind alone being discussed. Locke did much to establish psychology by beginning with his *tabula rasa*. This was like starting from the opposite pole. In Germany the influence of philosophy existed for a longer time; the effect of this can be noted from the ideas expressed. There was a gradual tendency to narrow the view of mind or soul, and a passage to more abstract principles. For example, from analyses we have it reduced to a "a series of feelings," or a "complex of sense and apperception," or identical with "vital force," or the "sum of inner experiences," or a "series of mental processes," etc. These are the results of mental analyses. Such a course of events in psychology—following out the line of analysis, has served a useful purpose.

[1] English Psychology, p. 23.

But the ground has been trodden over so much since the time of Kant that instead of analysis it might be better now to reverse the process, and take a constructive view of mind. It has been demonstrated from the results obtained that mental analysis is no longer a field productive of new material. Since evolution has become an established fact, psychology has not yet had time to fully adjust itself to a system that regards life as a serial whole. The entire animal series with man at its head becomes a field for mental research, and instead of depending on analysis alone, or even a study of mental development in the child, psychic manifestations can be noted all along this series, which, when correlated with the development of mind as it begins in the infant, gives us a field for constructive work. This is the meaning of genetic psychology. In this field several stages of the development of mental life can be recognized, or we may designate them as so many phases or view-points of the soul. Genetic psychology is really the "new psychology." Organic life at every stage manifests psychic elements, or possess certain psychic correlates; and psychology as a study is forming itself into a series that in some way parallels organic evolution. This is the newer picture we wish to present and from this point of view, from constructive elements, to observe some of the different ideas of soul. Dr. G. Stanley Hall is responsible more than any one else in this country for the setting of psychology in its proper relation to evolution as the term is now generally understood.

First we have what from the standpoint of the animal may be termed the biological soul. Porter recognized vital force as fundamental, this force, the principle of life, later develops, becoming synonymous with the soul or psyche. Külpe's classification recognizes this stage, and a more complete treatment from this standpoint is worked out by Ward [1] and Cope.[2] Under this head falls the totality of push upward as identified by Aristotle, also Schopenhauer's will to live.

The soul thus becomes co-extensive with life itself. Extinct species represent the loss of so much of the psyche. Since the dead far exceed the living thus far so much is lost and non-producible. A study of soul from this point of view must be purely objective. Comparison is a valuable aid. The vegetative, nutrient part of the soul is one of epi-phenomenon. Extreme plasticity is herein presupposed, corresponding in many respects to the protoplasm itself.

The species may be regarded as a type of soul. This may be termed the phyletic or race soul. For classification Jaëger's[3]

[1] Psychic Factors of Civilization.
[2] Primary Factors of Organic Evolution.
[3] *Entdeckung der Seele.*

view of animal life may be taken. He regarded every individual as possessed of a specific type or quality of soul, and the species manifest this quality as distinct from other species, far more sharply than any single individual. The revelations of the soul of any species are (1) the characteristic odors emitted, by means of which, any species may be identified from related ones; (2) taste, a mark revealing itself in the flesh, and by means of which the specie may be identified. While these marks of distinction may be of little significance every distinct species of higher animal life are to a certain extent typified by traits of character. These distinct traits of character coalesce in the life of the human individual. The phylectic soul represents a differentiation of the biological soul, it is far more limited. It is adapted to certain sets of conditions only. Each species may be regarded as representing a quality of the psychic whole finding its culmination in man.

A third view is that of the individual soul. This is the type represented in the writings of Royce,[1] Schiller,[2] and others. It is a special form of the phylectic soul and is the result of heredity. In this view much that is pre-existent determines the character of the soul. It includes the vitality of the individual.

A fourth view may be regarded as that of personal consciousness. This is our own experience. It is the sum total of conscious reactions. It is that part of the psyche that is dealt with most largely by philosophy. It is represented by some as based on memory, pleasure and pain, or is merely a group of sensations, etc. It is composed largely of volitional experiences. Its origin may be said to be the "hedonic threshold."

A fifth and last view is that of attention; this is the narrowest and represents merely a cross-section of the present moment. Here consciousness comes to a focus. For Herbart it is the unity of apperception, and might be so regarded for Wundt. As the focal point shifts over the experiential, psychic elements of the soul, the attention may be now one and now another element.

In this view of the psyche as a product of evolution, the object of genetic psychology is to trace the relation between these aspects of soul. Soul life is homogeneous throughout the animal series, that of man the highest product. To understand what is meant by the human soul we must refer back to those lower levels and get a larger view of what experience means.

From an outline like the above we get a picture of the evolving soul-life. As different from analytic psychology of the past it represents[3] a change of study from subjective to objective

[1] The World and the Individual, part II.
[2] The Riddle and the Sphinx.
[3] Ward: The Psychic Factors of Civilization, p. 125.

psychology, from feelings to intellect. From this manner of viewing soul we can only describe what phenomena it presents, but we cannot define it.

Studies of the Soul Based on Data Collected by Means of a Questionnaire.

A series of questions,[1] the answers to which would imply certain definitions of the soul, was sent out to a number of people for the purpose of ascertaining present ideas. In reply to these questions 124 returns were received, 64 males and 60 females. The ages of those replying vary from eight to sixty. The aim was to make the investigation as inclusive as possible, —the answers embody reports from persons educated in the public schools, and all grades to the degree of doctor of philosophy. About three-fourths of the returns, however, are from college students.

The data is suggestive rather than conclusive on any point.

One question to which a number of replies have been received was: "What experiences led you to think of the soul the first time?"

Of those who made reply to this question the following answers were received:

Parental teaching, 5 males and 5 females; Sunday school or church, 6 males and 1 female; Revival meeting, 2 males and 1 female; teachings of the Bible, 1 male; influence of other persons, 3 males and 1 female; thought of death, 1 male and 2 females; a picture of material hell, 1 female; consciousness of wrong doing, 1 male.

M., 23. "I saw the trees and earth, they did not move as I did, were apparently insensible to heat and cold, and to bruises, and did not think. Here I caught a glimpse of the soul that makes us human."

These are reminiscent ideas and bear out the testimony of Dr. Street's study that the individual first comes to know of his soul as something in relation to psychic activities. The results of Dr. Street opposed the theory of innate ideas, and led to the conclusion that the soul is the product of the psychic activities of man himself.

Of present experiences that lead to thoughts of the soul, the following may be taken as typical:

F., 22. When I think of the purpose of life.

F., 24. Experiences of every-day life.

M., 34. Moral responsibility.

M., 39. Moral responsibility.

M., 21. Religious discussions and studies in psychology.

M., 22. "Thoughts of eternity and poetry touching on soul or some such subject."

F., 26. Death, also contemplation of any beauty or wonder in nature. Any experience that arouses highest thoughts and emotions.

F., 43. "Anything that brings up religion or psychology."

F., 23. Philosophical or psychological reading, church service, sermons, or death of a friend.

F., 28. Reading and observing development of character.

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[1] Studies involving partly the same line of investigation will be found in the *American Jour. of Psy.*, Vol. IX, pp. 350-395. The Early Sense of Self, by Dr. Hall. *Pedagogical Seminary*, Vol. VI, pp. 267-313. A Genetic Study of Immortality, by Dr. Street.

F., 22. Is led to think of the soul "when touched by something grand in music, art, nature, or human character," also by any moral victory in her own life.

M., 21. Conscience.

M., 22. Any religious address or religious thought.

F., 20. Death of a friend or acquaintance; reading or hearing of spiritualism.

M., 42. Work as a minister, funerals. Also studies in psychology and sociology.

M., 31. "The rising and setting of the sun, birth and death of day; also death of a fellow being."

F., 29. "Sitting by the bedside of a dying patient."

M., 20. "Experiences where my life is concerned or after pleasure and amid solitude."

M. "Sad rather than joyful experiences are apt to lead me to think of it."

M., 19. "Any moral or ethical idea or question, which on reasoning back towards its ultimate origin involves a consideration of the soul."

M., 27. "Observation of the wonders of nature, and man whose capabilities are infinite, standing at the head of creation."

M., 20. "The reading of books on morals, a study of the Bible, listening to sermons. The presence of sickness, sadness, trouble, etc.

M., 23. "I think of the soul to-day when my attention is called to some of life's subjective phases,—anguish, prayer, love, music, art,—these things bore straight through the objective world and we know that there is something which we term the soul for convenience."

M., 27. "Feeling that *I* am *I*, a thinker, feeler, doer; an immaterial, spaceless, invisible, energizing somewhat, wholly different from the sensations conveyed through the bodily organs."

M., 25. "I am most frequently led to think of it when meditating upon some kindness, friendship, and love; in connection with or when beholding something beautiful, wonderful, or mysterious; and when a friend or some one of interest dies."

M., 47. "Anything that strongly suggests the self-interest in life and my relations to the world of 'others.'"

In noting these considerations one comes to the conclusion that those replying have something in mind, when they speak of the soul, that is not implied in the teaching of psychology, even though they have studied the subject as many of them have. Their ideas are testimony of religious teachings, or of the *feeling* of moral responsibility, or they refer to sentiments or emotion of some kind that affect one deeply; early religious training, and all that it implies has been stamped too deeply to be replaced by the results of analysis. It is as though the education of the intellect after all is merely on the surface and the feelings are immeasurably larger than cognition. The idea conveyed in many of these replies, more plainly shown than in the definitions given, is that of a something, existing, of some kind, that can be touched by emotions of sadness, beauty, wonder, love, music, etc., these things relate to the soul as they understand it because they call it to mind.

The number of definite answers received in reply to the question as to what age they first thought of the soul, would not justify any conclusion, but the age seems to vary from three years (in two instances) to eight or nine.

Material idea of soul. Of those who at some time thought the soul to be something material, 34 males and 36 females made reply.

Seven males and eight females thought it was made of *human flesh*.

Six males and three females thought it was made of some light, *transparent* material.

Three males and six females thought it was *mist, cloud* or *air.*

One male and three females thought it some *substance,* hard or soft.

As to how it was identified:

Three males and one female thought the soul was identical with, or similar to, the *body.*

Five males and two females thought it some *part* of the *body.*

Three males and one female thought it was some *organ* of the *body.*

Three males and three females thought the soul to be identical with, or similar to, the *heart.*

One male thought it was the *brain.*

One female thought it was the *breath.*

Four males and two females thought it was an invisible *being,* developing in the body.

Four males and two females called it an *angel.*

Three males and five females identified the soul with *mist, cloud* or *air.*

Three females thought it was an indescribable *mass* of something.

One female thought the soul was a little *flame.*

One female " " " " white *butterfly.*

One female " " " " small, white *dove.*

One female " " " " *something* with *wings.*

One male " " " " a small, *airy object,* pointed.

As to shape:

Nine males and six females thought the soul had the form of the *human body.*

One female thought it was like "a dim, white, *flat surface.*"

One female thought the soul shaped like the *sole* of a *shoe.*

One female thought of it as a vague *shadowy outline.*

One female thought it took the form of *two oysters,* side by side, and connected at the top.

Two females conceived of the soul as *oval* in shape.

One female thought it was *round.*

As to material, shape, form, etc., of childish views, the data only strengthens that already collected,[1] and as has been suggested [2] these views of children parallel the notions of primitive man. This parallelism is brought out very forcibly if a comparison of these reminiscent views be made with the studies I have collected on primitive notions of the soul. All those replying, sometime during their childhood had thought of the soul; in most cases they were able to give the instance in which the idea was first brought to mind. The picture of heaven,—the dwelling place of the soul—a description usually very beautiful to the mind of the child takes firm root. With this idea of heaven, as the place where the good souls dwell, and from which the bad ones are shut out—the child associates at once the idea of the soul as that part of the person surviving death; this picture and all that it implies to the child becomes very precious to him. He likes to talk about heaven, to learn all he can about it because he may dwell there sometime, the soul thus becomes something that must be cared for, at the same time, however, the childish imagination, unable to think of this part of his nature, associates it with some material object.

As to the age when the change of ideas takes place, only those stating positively were selected. To this question, 13 males and 7 females replied.

Between 10 and 12—Five females and two males.

" 12 " 15—Three females and three males.

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[1] Dr. Hall: *op. loc.*, p. 372.
[2] Street: *op. loc.*, p. 277.

Between 15 and 20—Six males.
" 20 " 25—One male and one female.
" 30 " 40—One male.

This point has been brought out more forcibly in Street's returns, since he had a larger amount of data than is here given. In nearly every case of adult experience a change occurring during the adolescent period was noted, yet only those stating definitely the age when the change occurred have been selected.

Where the soul is located.

Those who have at any time fancied, or who now fancy, the soul as located, within or without the body, replied as follows:

In the brain, four males and six females; in the head, five males and two females; in or near the heart, eight males and thirteen females; in the breast or lungs, two males and three females; in the entire body, two males; in the trunk somewhere, one male; anywhere above the diaphram, one female; around the head and trunk (as a vaporous substance), one male; exterior to, but near the body, one female; in the sky, one female.

Anything about which we think relates itself to something else; this association has led to the location of the soul. And this leads again to the connection of soul and body. The views selected are not reminiscent, but present ideas. The following are selected:

F., 28. "A spirituality dwelling in the physical body throughout."

M., 42. "I think of the soul as dwelling in the body, as permeating the whole body as a spiritual substance."

M., —. "Like perfume about a rose."

M., —. Thinks of it as permeating the body.

F., —. Thinks it pervades every fiber.

M., 40. Thinks "concomitance partly commends itself."

F., 43. Likens connection between soul and body to "electricity and the machine it runs through."

F., 23. "I think of it as diffused more or less over me."

F., —. Thinks the soul is encased somewhere in the body.

M., 19. "I fancy the soul as residing in the head in connection with the brain."

M., 19. "I fancy the soul as connected with the whole and entire body, with its centres in the heart and in conscience."

M., 21. "I have fancied that the body is a 'vessel' or the medium through which the mind has its expression and being."

F., 26. Sometimes fancies the soul as a distinct, separable something lodged in the body during its earthly career.

F., 23. Used to fancy the soul "connected with the body much as the works of a watch are in the watch case."

F., —. Used to fancy the soul "floated about in the body."

M., 20. "I think it is in the body or just something that is merely association with it."

M., 21. Thinks of the soul "as part of, perhaps combining the higher and nobler qualities," of a person.

M., 27. "I fancy that the soul has merely a temporary home in the body. I have always thought of each as being separate, and as going together for a purpose."

M., 26. "I now think the soul connected with the body as the mind; perhaps they are the same."

M., 47. Thinks the soul and body are inseparable, that is, "They never existed apart."

Any boundaries marking off psychology from philosophy are at once transcended by many of the above ideas which suggest discussions of scholastic times. They are further suggestive of the idea that religion with which the soul is associated, as can be seen from many of the

citations, is a separate field from that of philosophy, and of the two types, the influences that affect the religious man are more general and appeal to the masses of people; while those affecting the philosopher are more specialized.

As to the origin of the soul, sixteen males and thirteen females replied.

Nine males and four females believe that the soul comes to the body at birth; four males and four females, with the beginning of the life of the body. Two males think the soul is wrapped up in the embryo. One male thinks the soul does not come until the child's mind is capable of real thought; and one female thinks it comes with the awakening of consciousness.

These ideas are suggestive although they differ as to the period of the child's life when the soul is supposed to enter the body. In Dr. Hall's splendid study[1] the soul unfolds and develops from the materials of its environment. Baldwin[2] attempts to trace the social development of the self—the stages of its growth as they are formed—from contact with other persons. Street observes that the growth of the soul parallels the growth of the body. As will be noted from the answers most of them merely refer to the time of the inception of the soul.

Reminiscent ideas. As to how the earliest impressions were regarded and some description of these, the following may be taken as examples:

F., 20. "My earliest notion of the soul was as a part of my body. I thought it was a part just over my lungs and heart, and that in death the angels came and took this away, and flew with it to heaven."

F., 22. "Probably about 7 years old I associated it with my body, an inner organ, near to or the same as my heart. It was white when I was good, and spotted when I was bad. Later I thought of it as an angel with white wings."

M., 21. "I thought of the soul as an object, where it was situated I do not know only it was in the trunk somewhere. I thought of it as a small airy object, pointed, and I thought that after death some way or other it got out of the body and in some way escaped out of the house and then went directly to heaven. How it now assumed shape and lived I could never make myself understand."

F., 19. "My earliest notion of the soul was of its shape rather than of what it really is. I saw an indescribable mass, light gray in color, something the shape of an egg, more oblong than round; but it seemed as if this at times changed its shape, according to the moods the possessor was in towards God. For I conceived the soul to be nearer to the Almighty than any other part of the body and more closely directly concerned with God. From something connected with one of my earliest physiology lessons, I got the idea that the soul was located near the heart, in the central part of the body."

F., 20. "I thought the soul was of the same shape as the body until my tenth year. I thought it was encased somewhere in the body."

F., 22. "My earliest notion of the soul was that it was a misty, vaporous form, intangible, and yet never breaking into pieces or flying off into atoms like vapor; it was located somewhere near the apex of the heart, but escaped at death, and, changing its form, as a volume of smoke does, it gently and slowly found its way, in a direct line, to the home where it was always to remain, after taking a human form though not a human body."

F., 20. "I was four or five years old. I thought of it then only be-

[1] *Op. cit.*
[2] Social and Ethical Interpretations.

cause I heard people speak of it. I never had a clear idea of what it was. It seemed like a white, thin cloud mass.

"The form seemed the same as the sole of a shoe. About four years old. I never thought of it as located, it floated about in my body."

M., 23. "I was probably 8 or 10 years old when I first thought of the soul. At first I saw it in form of an angel, probably caused by seeing the pictures of angels."

F., 43. "At the age of 8, I thought it was similar to my body and by putting this off the soul would be revealed and that its beauty or ugliness depended upon my thoughts and actions.

"I thought that God made souls and put them into bodies in a very material fashion, very much as yeast might be kneaded into bread."

M., 26. "About 12 years. I thought some kind of organ indescribable located in or about the heart. I used to think the heart of man was the soul, and that the heart would never die nor could it be destroyed. This view was also strengthened by the fact that the hearts of animals are so hard to cook or burn to ashes."

To one who studies the reminiscent returns of early childhood, there is something akin to sacredness in the simplicity of the views expressed. The child-like faith has accepted all these pictures which involve the survival of the soul and with which it is associated. Such thoughts as these, with others stating similar temporal ideas and offering promise to the child, form the hope of its early life. They are events to which it looks forward. During past ages such pictures have been the hope of the race, just as the savage looks forward to the happy hunting ground. Who can tell how much they have promoted the development of humanity?

They are the elements forming much of the early mental food of the child. Not much depends on the method of teaching these beliefs, but if they are omitted are we not withholding from the child things it demands? Shall we teach them? Shall we teach the child things that have to be corrected later? With reference to the soul, heaven, etc., most people would say "yes." If, as for Herbart, Interest is the dominant thing—then myth and all the folk-tales dear to child life have their place, while if we follow the sometimes too utilitarian idea of attempting to teach nothing that will have to be untaught, some of the things for which the child-mind may hunger will be omitted. There is good soil in the mental life of the child for flights of the imagination based on ideas connected with the soul, in fact he pictures another world with its inhabitants, the ideas take firm root, and they are so vivid that in most cases they are remembered until old age. Adolescent views of the soul may be gathered from the following:

F., 43. "'Childish notion' replaced by an idea of soul as an immaterial thing, yet still resembling the material *me*."

M., 40. "At 12 or 13 years of age thought the soul 'an immortal something, parallel with the mind.' 'An abstraction.'"

M., 26. "Yes. My idea about the soul is different now. At one period of my life—from 16 to 20—I thought the soul separate from the mind."

M., 19. "At about 12 I began to think of the soul as being immortal, and not made of material substance."

M., 19. "I thought the soul had a human form when about the age of 13 or 14. The form was exactly that of the human body."

M., 23. "Of late years my idea of soul has changed. I have never studied the soul much, but about 12 or 15 years of age I began to consider the soul as something without form that dwelled in the body. When considered that the body decayed I could not think of the soul having form."

F., 24. "Yes. I thought it was a small round something—I was then about 13 or 14 years of age."

M., 21. "About 14. Thought it was an essence."

The opinion now generally held of the expansion of the mind at the beginning of the adolescent period is here illustrated. The old material ideas are cut loose from and new ones peculiarly individual are formed. The character of these changes have been brought out in some of their different phases of late,—especially former studies here at Clark University. While, as was noted above, only twenty stated definitely the time when their ideas changed, many more stated, indefinitely, the time as falling within the adolescent period. Several speak of the change as being to one of an abstract or immaterial substance of some kind. This they have gained largely from three sources,—conversation, reading, and their own thinking. Judging, however, from the replies, conversation and individual thought play the larger part. The study of psychology is claimed by some as the cause of the change. From its effects one says, "Now I am entirely unsettled and have no definite notion or idea of the soul." Several claim that they are unable to define their position from recently studying this subject; the study of physiology, and the reading of different books, Cicero, Emerson, George Eliot, and other books are mentioned as influential. Of those not having college training the Bible is relied upon in most cases at the critical period. It is suggestive of the need of a special literature for this period,—and perhaps even for this subject.

The effect of psychology may more effectually destroy the early impression but the changes come without this, and there may be other studies that lead to worse effects than this.

Three negative replies were received. One of those answering had received only a common school education, one is by profession a dentist, the other while still a college student has spent two years in the study of medicine. The following extracts from their replies are given:

M., 43. Dentist:

"'At what age did you first think of the soul?' When I was very ignorant of the laws of nature. 'What did you think it was?' I thought it was something which some infinite substance or being had injected or put into me to live and carry my identity after the death of the body in another world they call heaven. 'What did you think it was?' I thought it was the life of every one. 'What is your present idea of the soul?' My idea is that the substance or thing called force is usually called or thought to be the soul. I arrived at my conclusion by reading and thinking both—comparing ideas.

"In my natural and spontaneous thinking I have come to the conclusion that I know as little about the soul as Spencer and I do not care about a thing that I think no one knows anything or can know anything about. We can understand and know something about material things, then why should we bother ourselves with immaterial things?"

As to the future life: "I would prefer to sleep the dreamless sleep. I would like for every one to be as kind, good and forgiving to their fellow creatures as they possibly can and I would like, if there should be such a being as a *God*, for him, her or it, to be as kind and gentle as was Mr. Ingersoll, Voltaire, Paine and a host of others that I could mention."

M., 23. American; candidate for the degree of A. B., 1903, studied medicine two years. "At about the age of 16 I thought of the soul as existing and occupying space within the cranium. It seemed ethereal, without shape or mass. Later, I thought it to be something apart from my ordinary self, something more than human. Perhaps a fre-

quent recurrence of thoughts about the nature of God caused the change in my conception of the soul.

"At the present time I do not believe in the existence of the soul. I think that human life is the product of evolution and that in the beginning all life, both animal and vegetable, was the same, or that they had a common ancestor. All life manifests the power of growth and reproduction; the mere differentiation of function and the acquiring of powers of judgment, reason, etc., do not seem to me to warrant the belief in the existence of the soul. The law of the indestructibility of matter cannot be applied to the phenomena of life. The mind may be completely destroyed; mental processes cease when the body dies.

"If the soul exists in the human adult does it not also exist in the infant, in the embryo, in the original cell in which that particular being took his beginning? It is impossible for me to reason out such a state of affairs. If the soul is a fact, should not all life possess it?"

M., 28. Common schools. "I do not think I have a soul. What is commonly called the soul is that part of a human being which is supposed to exist and be immortal. What is called the soul is really the mind. Biblical teachings first led me to think of it. Daily observation and reflection leads me to think of it as a superstition with which a considerable portion of mankind is afflicted.

"I have never thought of the soul as having shape or form, but have considered it my emotions, which I can feel, and which can cause pain or gladness, bring out in my actions and words the good and bad. I now consider what is called the soul to be the emotions, a creature of the mind, the mind a creature of the brain and animal organism, a body. I do not think of the soul as existing anywhere, except in the imaginations and faith of a lot of people, who have no reason for believing in it other than they have been educated to believe in a thing they have never seen and no one else has seen. My conclusions are from my own thinking."

It will be observed that the first writer speaks of force, and from the men to whom he refers would probably be classed by orthodoxy as an infidel. The second is a thorough-going evolutionist and no doubt, as for many biologists, soul has no place, and mind itself is merely a product of matter. The third believes the soul to be the emotions, merely a product of the mind, *i. e.*, of the imagination, this the result of his own thinking. It has often been observed that the study of biology, or even a preparation for medicine, expands the somatic field and its importance and consequently contracts the psychic world.

The following returns are exemplary of what may be termed the theological view of the soul. The orthodox idea expressed by clergymen, and those strongly influenced by religious training to such an extent that they have not been much affected by any contradictory teaching. The following view is from a minister, a university graduate with theological training:

M., 39. "Yes—I *am* a soul or personal being; never say I *have* a soul. In childhood I thought my soul was a *part of me*. Later I came to use *soul* as identical with the *I*, the personal and moral self-consciousness.

"The question as to what it was made of did not occur to me. That childhood idea was evidently impressed on my mind from without. The changes that came as I met other views and criticisms of that view, and came to think somewhat independently, were rather in the line of development and filling in of detail than towards contrary views.

"My present idea is already stated. 'I *am* a soul,' *i. e.*, a self-conscious centre of personal activity with a sense of responsibility for

my deeds, words and thoughts. As such self-conscious centre of personal activity I expect to endure after the change of death. This view is the result of many factors in which my own thinking has largely had the function of passing in review, rejecting, or accepting, or combining elements from many sources. From 8 to 14 years of age I was surrounded by spiritualistic believers of the very highest type. At 15 I joined the Unitarian church. During my college course (at Bowdoin) I was brought under Congregational influence. In the University I became familiar with Oriental philosophies and religions as well as undergoing the usual theological discipline. I have also had some training in science and have a special knowledge of botany. In my thought the soul has a closer connection with the body in waking moments than in sleep, in intense work and feeling than in idleness, in health than in sickness. I am convinced that the soul may temporarily leave the body under certain conditions and return to it again.

"My imagination of the souls of dead people practically amounts to an indentity with their bodies; yet my intellect tells me that while a body,—*i. e.*, form and substance—may be necessary as a basis or accompaniment to personal self-consciousness it can never be its essence. Gross or ethereal it is not the body we mean when we say 'I' or 'He.' I imagine differences of form and feature, differences of knowledge, and differences of character between souls of the dead. Those who died many centuries ago would presumably differ from those recently dead by so much as the conditions to which they were subjected for so long a time differ from conditions here. It is a matter of pure imagination.

"I conceive souls to differ in themselves according as they have lived well or ill, to differ in capacity, outlook and attitude towards environment. The environment would presumably differ also to some extent, as differences in make-up would lead to different choices and different outside pressures just as under the conditions with which we are familiar."

F., 32. University graduate. "My ideas, I should say I derived from the teachings of others in the beginning. Next the knowledge I gained from books emphasized them. And since I have been capable of giving the subject any serious consideration I do not remember to have ever fancied the soul as having form. It always appealed to me as a mysterious, impalpable eternal power belonging to each creature and modified by the earthly actions of the creature.

"I am more thoroughly convinced of the soul's reality. The fact that we pass through all sorts of experiences while all the physical senses are at rest seems to me to prove that they are only vehicles, the real power is something outside and beyond. My ideas concerning the soul have not changed very decidedly. I believe that the capacity of our enjoyment of the future life will be the measure of our development of this life; and our suffering the same way. When I begin to speculate as to what eternity will be like I usually end with the thought that we are too much of the earth earthy to have any notion of it and am satisfied to leave it all with Him who knoweth best."

M., 54. Graduate of college and Theological Seminary. In answer to the questions replies:

"I am a soul. I habitually think of myself as an immortal being. Can't remember much about my early conceptions as to what the soul was, or what it was made of. Simply thought of it as something immaterial and other than the body. My ideas have not changed but are clearer and more definite. Study of the Bible, psychology and theology have gradually added to and enlarged my conceptions. I have tried

to conceive of the soul as having form and shape, or something corresponding to these as belonging to immaterial or spiritual entities. In my mind the spirit form corresponds to the material. This idea is the result of thought in later years. I think of the soul as in some sense occupying the whole physical tabernacle. Or I am a soul occupying my whole body, which though not essential to my conscious existence is necessary to my completeness.

"My present idea is that it is a simple, immaterial, substantial, sentient, intelligent entity, having what corresponds to local form, capable of moving from place to place, and naturally clothing itself in the material human form. I have derived this idea from books and my own thinking mainly. Most largely from the Bible,—such passages as I Cor. 15th Chapter; II Cor. 5; Rev. 20, etc.

"I have thought of the soul or spirit as dwelling in the whole body having some sort of a vital connection with the nervous, arterial and other systems of the body,—a connection, however, that is as yet incomprehensible. I think the soul was conceived in the womb with the body. I think it leaves the body when the vital connection with it is severed, and this is at the instant when the body may be pronounced as dead. 'The body without the spirit is dead.' The soul cannot sever its own vital connection with the body by any power of the will. But when some external force, like disease, or violence, or an accident or a shock, does sever that connection by intercepting the vital process, I conceive of the soul thus released as *ascending* from the body as if from a weight that had been holding it down. This idea may be instinctive or derived from scripture passages like Eccl. 3:21. I think of the soul as connected with the body as closely and inevitably at one time as at another, though the thoughts of the soul may have freer and wider range at some times than at others—as in dreams, visions, telepathic communion, etc. . . .

"The physical differences in bodies as to sex, age, culture, etc., suggest to me corresponding differences in the souls that occupied them, except as to mere physical infirmities and limitations. I regard the souls of those who died long ago substantially the same as those who died to-day.

"I conceive of the souls of the dead, especially of the 'dead in Christ,' as having larger physical and psychic powers, freer and more extended movement, g ater knowledge, nobler disposition, etc., though as somehow suffering a limitation to be supplied by their glorified bodies. As to their own past, the righteous recognize God's mercies and praise him for them, while the wicked can only review it with wretchedness and remorse. I think they remember living friends and feel an interest in them, as the parable of the rich man and Lazarus teaches. And that they are conscious of the presence of each other, and feel mutual love and fellowship, or hatred and repulsion, according to character and condition. I think the righteous dead, though they are 'the spirits of just men made perfect,' are still capable of learning and developing."

The theological idea of the soul, as may be observed, is changing from what it has been in the past. Instead of the soul being regarded as something God creates and puts into the body, instead of observing that "I have a soul," the term "I am" is used. One minister says he used to regard the soul as something plus the body, but cannot now hold that view. The idea of an entity of some kind, having shape or form, is still preserved. Many persons, as is noted in the above, regard the soul as more closely connected with the body at some times than at others, especially during work and activity. As to future existence, the ideas have not changed greatly from those of the Patristic Fathers.

Psychological. The following notions show the influence of the teaching of psychology on early impressions and may be classified as psychological views as expressed by the average person. The extent of education is noted in each instance.

F. Normal school graduate. "Mind and soul mean the same to me now in one sense. Still my old spiritual idea of the soul as apart from intellect has never been quite lost. My childish notion regarding soul was the outcome of my own imagination simply."

M., 19. In college. "The age at which I first had any definite idea of the soul in my mind was between the years 6 and 10. After this first idea of the soul, which was in some way shaken and disfigured, my idea of the soul became much less definite. While in some ways my ideas remained unaltered, the form and abode of it were entirely undefined. This change came when I was about 12 years of age. And to say the truth during the past few years of my university life, and especially since studying psychology, I find my idea of the soul growing less and less definite as far as its separate existence is concerned, and becoming more and more involved in and co-existent with mind. As nearly as I can now define it, my conception of the soul is: an ethereal entity existing in the mind."

F. College student. "The soul is the sensations, perceptions, memories, etc., that live after death. It has no form, is something that cannot be seen. As to the location, I should say it is in the mind. This is the relation of mind to soul. I think the spirit and soul are the same."

M., 32. Doctor of philosophy, teacher of psychology. "I have almost lost the early notion and cannot definitely recall it. It has changed by imperceptible gradations into a present notion of *mind* (or soul—I use the terms interchangeably) which yet seems to flit from region to region of the brain with the stream of consciousness, always covering a considerable area. It no longer has the "foggy" appearance, and indeed is quite indescribable, but is confined to the *brain* and mainly at least to the brain cortex. The changes from the early notion have come almost wholly from my learning about the brain, and when I think of soul or mind at present there is always, I think, some image of *brains* that I have handled and seen in my study of neurology.

"I make no distinction, in my habit and thinking, between soul, mind, and spirit, except that soul seems a larger thing—to include the unconscious, temporarily forgetten part of the psyche. I suppose, too, that *spirit* keeps something of my old notion of it as a light airy something that *goes up* when we die—it has a more ghostly, quick-moving, time and space-transcending quality than either *mind* or *soul*. Probably my notion of the original meaning of the Latin *spiritus* has influenced this. Mind has long been largely synonymous with *intellect* with me, and I find it difficult to make it include the feelings, then, as a psychologist I have often argued for the use of 'mind' for the whole psyche.

"I have come more and more to think of mind or soul as the *fundamental* thing about the psycho-physical organism, and that mind constructs the body more than body produces mind. That is, heredity is a *psychic* rather than a *physical* matter, is memory. As the soul was itself, with but a *single cell*, as the body, so it may persist whenever adult body drops away in death, and may construct another body, possibly, when the environment becomes suitable for the purpose—a very different body, perhaps, suitable to a different environment.

"These are but *dreams* about the soul, but they describe a conception of it that goes with me now as the old 'gray vapor' image went with me as a child."

F., 43. Graduate of college and university. "I have thought of the soul, mind or self,—the name which I apply to it depends upon the connection; in a psychological discussion I should probably call it the self, the ego, the me, or the unifying principle of consciousness; in a religious connection I should be likely to use soul, and in ordinary conversation, mind. . . . .

"I cannot remember definitely at what age I first thought of soul but I can, from external circumstances of which I know the date, state that I had definite ideas about it at the age of 8. I thought it was similar to my body, and by putting this off the soul would be revealed and that its beauty or ugliness depended upon my thoughts and actions. My ideas have changed from time to time but I cannot locate these changes in time. At the age of 12 I had outgrown the idea given above, but cannot tell when it happened or whether it was a growth too slow to be noticed. It was replaced by an idea of soul as an immaterial thing yet still resembling the material me.

"I have always thought of the soul as having shape or form as given above. I always used to think of the soul as located somewhere, usually in the sky. The tendency to do so is still present at times.

"My present idea of the soul is the unity underlying states of consciousness. It is probably derived from books, other people and thinking combined.

"The only thing to which I can liken my idea of the connection of soul and body is to electricity and the machine it runs, though that is a crude simile. At one time I thought of it as permeating the body like a gas but I cannot tell at what age I thought this. I see no reason why the soul should not begin when the body does, prenatally. I have never had any idea how it came since I lost the childish one that God made souls and put them into bodies in a very material fashion, very much as yeast might be kneaded into bread. It seems to me that the soul leaves the body when consciousness ceases. I suppose I think of it as floating off into space somewhere if I try to envisage it. The soul seems to me most closely connected with the body in full waking consciousness and greatest activity.

"I usually think of the soul as expressed in conscious states without envisaging any particular form. If I think of form at all it is a copy of the body but without material substance. I conceive souls as differing in development, therefore no two would be precisely alike, but apart from that I know of no difference that the time in which one lived would make.

"The only difference which I think of as existing between the souls of the dead and the living is the freedom from bodily limitations in time and space. With that freedom it seems to me that the past would be more clearly seen and differently viewed, and the affections stronger, purer and freed from selfishness. Under such conditions learning and improving seem the natural result."

Philosophical ideas. Classed as philosophical the extracts of the following may be given. Few of the returns indicate any philosophical system worked out.

F. College student. "My first idea of soul remainedwith me until I was about 10 years of age; then I began to reason with myself about it, and to listen to others talk of it. My original notion gradually faded, and for several years I had no notion whatever of it. Then, at about 15, I began to form my present notion: I believe the soul is an atom of the all-knowing, all-loving, all-creating power called God; that it always has existed in some form or other, and always will continue to exist. As the power creates, it infuses itself into its creatures, so that every living thing, plant and animal, contains a spark

of the fire which cannot be extinguished. Following out this plan, then, it is unjust that one of these sparks should be placed on earth as a poor, dumb earth-worm, while another is an intelligent, deep-minded human being. For this reason, I believe that every atom of Life-Power will be given the opportunity of completing its cycle; it began from the original Power, it will complete its development, and again return to the Power. I do not say that I believe in transmigration of the soul from the lower to the higher forms, or from animal to the human form: I have not settled this point to *my own* satisfaction, nor do I expect to do so. Nor can I reconcile the Life-Power in plants with that in man. But I *feel*, rather than *reason*, that such a soul exists in them.

"I think the soul is composed of two parts,—spirit and mind. I have never considered the spirit as different from the soul, excepting that it is the *Life* element; the mind is the intelligence element; the part that is developed and broadened during life; even the 'spiritual education' is only a higher, purer mindedness, and is mental. If the soul is immortal, as I firmly believe it is, then both spirit and mind exist after death, but the mind is not as *highly organized* as the spirit, if such a term could be applied to something which always was. The mind is largely under our own control,—its broadening and development or its entire neglect—and may be so infused with wrong ideas and notions that all we have spent a lifetime in learning will have to be unlearned hereafter. But there is no arbitrary phase of the spirit; it was and will be, and we can merely change its form by taking life."

M., 47. College and university. A teacher of mathematics but a student of philosophy.

"(b) The permanent '*I*.'

"(c) The same as the '*I*.'

"(d) They have grown in clearness and definiteness mainly as the result of increased knowledge of *self* as a knowing, willing and sentient being. There has been no *radical change of idea* in my experience of *self*. Only a development with increased knowledge and general experience.

"2. (a) Yes.

"(b) Certainly, I *am* one. (A soul.)

"(c) The same as to myself.

"4. (a) Yes, the form of the body. I have not to my knowledge ever dissociated the form of the soul from that of the body.

"5. (a) The soul is the permanent self.

"(b) Came to the body when the body came to it. They *never existed apart*. No soul without body. No body without soul.

"(c) At death the corpse is no longer a 'body.' Its functions have ceased. Both body and soul have left the corpse behind.

"(d) Body is body only in so far as it is organic to soul, therefore one may be permitted to say that the connection between soul and body is more apparent at one time than another, *e. g.*, waking than sleeping, action than inaction, etc., but I see no reason for regarding this distinction as final, since *visibility* and *externality* are not the true criteria of soul activity. The only criterion is permanence.

"Souls of the dead are of size and form of body in life, not subject to gravity; capable of penetrating all matter unobstructed, and transcending all limitations of time and place. I have conceived souls as retaining sex distinctions but only in an ideal sense. Children remain children with developed intelligence, but still retaining the naïve simplicity of the child. Cultured and ignorant remain relatively so.

"Yes, as the soul is the developed form of the 'Ego,' it would naturally be different in different ages, as among different peoples and different individuals.

"In my early days of course the current theological dogmas as to rewards and punishments appealed to my imagination, though I cannot say that they ever satisfied my intellect. Now I think every soul carries into the hereafter the accumulated heritage from earth and will find its place in the further process of evolution according to its own choice and capacity. But I do not think we can judge the destiny of a soul by any time standard. Every soul is organic in a great purpose and can be judged only in reference to its service towards that end. Good and bad are largely relative to a time judgment and may have little significance relative to the real function of a soul as an organ in the world history.

"Well-doing can have meaning only in reference to environment. No soul exists apart from an environment. There is no absolute self.

"My ideal life, here and hereafter, is 'fitness for the place I occupy.' I hold this ideal in no fatalistic sense but in the conviction that man attains such perfection as is possible for him by filling well (*i. e.*, in good will) the place in which he finds himself."

Not all of the returns admitted of classification as here outlined. Most of them, strictly speaking, would fall into the theological group,—a small number might be classed as psychological and a smaller number as philosophical. But as a group, perhaps brought out by the questions, the replies all bear testimony that the writers of them have been influenced by religious training. If they may be taken as an index they show how lightly our instruction in psychology, the purpose it serves in life—compared with the vital question of theology—falls on the surface of the mental content. From the returns, the mind or the self, while they may be regarded as the equivalents of the term soul, have never commanded the thought or attention of those replying as has the soul; this can be easily observed from the language. If the psychologist desires to replace this word, unless there is a radical change in our methods of education, such an effect will not soon be changed. Current psychology has cast off the very term, the name of the very core about which it developed. A term in its early days considered so vital and so sacred that men have suffered anathema and ostracism for their adherence to opinions regarded as detrimental to society. In order that the student may understand how bitter and costly these disputes have been—what persons have suffered for daring to express an opinion, something in regard to the history of the term should be incorporated in our psychologies. We bespeak at least for modern psychology a chapter that will briefly state its history.

Many of the replies were from students engaged in the study of psychology, others, from psychologists at present teaching the subject. From the returns it would seem that soul and mind are in most cases identified, and yet like a double load they are trying to carry. The ideas are for the most part in harmony with current psychology, but when detailed explanations are required in regard to soul, they tend to fall in line with

theology. In details they do not adhere strictly to current psychology. This is no doubt due to the fact that students replying have not gone into the subject very deeply, *i. e.*, have not had sufficient time perhaps to master the text they may be using. Moreover, comparatively few students who elect the subjects of philosophy and psychology have the analytic turn of mind necessary to pursue the subjects for the pleasure derived from them long enough to thus become thorough-going psychologists.

Summary. The idea of a soul will continue to exist as long as the idea of an immortal being or substance persists.

Theology has considered soul with special reference to a personal God. It presupposes a substantial survival after death. The present theological idea of soul is largely what is meant by the totality of a man's life. The influence of the church is the greatest factor in moulding ideas in regard to the soul. Recent psychology has tended to ignore the idea although centered about this point it had its birth. It presents a hostile attitude toward the idea. Empirical psychology, dealing only with the phenomena of mind, recognizes no unifying factor but consciousness.

The teachings of the church in regard to the soul reach the thousands, while those of psychology reach the few; the masses of people believe in some soul substance. The effect of psychology is to destroy something—which may be satisfactorily explained for the psychologist, but not for the uneducated. The definition of soul by the average person would be to the effect that the substance of it, so to speak, is found in the feelings. The feelings alone recognize its substance. Modern psychology has not fully investigated the feelings.

Ideas of Materialists Regarding the Soul.

A study of the subject is not complete if materialism is not represented.

Materialistic ideas of soul, spirit or mind, represent it as a substance, usually of very fine particles, as, for example, the views of Democritus, those of the Epicureans, the Stoics, Lucretius, and those of certain modern writers. La Mettrie regarded it as a fluid passing through the nerve tubes, and Holbach could not distinguish it from the brain—thought is hidden in the movements of its fibres. For [1] Czolbe sensation is motion, resulting externally; the turning back of this motion in the brain, on itself—from all the senses—forms the unity of consciousness. For Haeckel, spirit and mind are reduced to force and are inseparably connected with the body, as much a

[1] Lange: History of Materialism.

function as every force is of a body. For Moleschott it is a product of the brain as bile is a product of the liver. For Büchner it is a property, or capacity—as the force of a steam engine inseparable from the steam. Or for others it is an ethereal substance, and it may or may not be a product of the body, as the following:

"The ether,[1] then, as it is coming to be apprehended in the new modes of thought, is an immaterial, superphysical substance, filling all space, carrying in its infinite throbbing bosom the specks of aggregated dynamic force called worlds. It embodies the ultimate spiritual principle, and represents the unity of those forces and energies from which spring, as their source, all phenomena, physical, mental, and spiritual, as they are known to man."

Or another view is that of a universal liquid of minute molecules.

"The[2] molecules are vortex rings in a liquid of still finer grain and less viscosity. Molecules, liquid, molecules, liquid, alternately forever; each term of the infinite series being fully explained by the next following." The second ether fashions the spiritual body. Our consciousness proceeds *pari passu* with molecular disturbance in our brains, this molecular disturbance agitates the first ether, which transfers a part of its energy to the second. "Thus is gradually elaborated an organism in that second or unseen universe, with whose motions our consciousness is as much connected as it is with our material bodies." The spiritual body is replete with energy at death and floats away in the unseen universe, taking consciousness with it, but leaving its molecules behind.

Another view:

"Soul[3] is the body or organ of the mind, and as such they are inseparable forever. Mind and soul are one; soul and body are two. Soul is a refined subtle essence, a spiritual body within the animal body an ultimate indecomposable, ethereal matter, something like an electric body, and as such, quite as material as rock or pig iron, and is conscious by its nature as atoms are cohesive by their nature. . . . . It grows as other matter grows, is enduring and persistent like all other elements, preserves its identity and continuity precisely as the body does, and is immortal because of more homogeneous and ultimate essence than the physiology. Repeated shocks will disintegrate and weaken the cohesion of the soul as they will the cohesion of the iron."

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[1] Stockwell: New Modes of Thought, p. 73.
[2] Clifford: Lectures and Essays, Vol. I, pp. 282-92.
[3] Hemstreet: Mind is Matter, pp. 30-39.

It will be observed that some of the so-called materialists regard the soul as a product of the body but do not attempt to ascribe its form or assert what they think to be the nature of its substance. Others would give some theory as to its composition. The ethereal view of soul or mind substance, in the light of recent discoveries, will probably claim for itself a larger circle of adherents.

Theories Presented Regarding the Self.

The word "self" has tended to take the place of "soul" in recent psychology and philosophy. From the standpoint of philosophy, soul is supposed to be too inclusive;—if immortality is presupposed, there is the objection that it embodies certain elements not immortal, while self, more definitely an object of knowledge is immortal.

The reason why the term "self" is used in preference to that of soul, or why the meaning conveyed may not justify the use of a broader term as that of "soul," may be better understood if we cite some explantions from recent writers.

Prof. James[1] speaks of the empirical self of each person as the "me." The social self is the recognition we get from our fellow beings, the effort of living in the sight of our fellows. Truly speaking "a man has as many social selves as there are individuals who recognize him and carry an image of him in their mind."

The spiritual self is the inner or subjective being, the "psychic faculties or dispositions, taken concretely" not the principle of unity or pure ego. These psychic dispositions are the most ultimate part of the self—and also the most enduring. These are changed only when a man is *alientus a se*.

The Pure Ego is the unifying factor, in it is found the sense of personal identity. Our remoter, spiritual, material and social selves come with a glow and a warmth, in the aroused organic emotion. This warmth is either something in feeling of the thought, or else the feeling of the body's actual existence. We cannot recognize our present self without one of these. Any distant self which fulfills this condition will have the same warmth, but may be in less degree. This thread that runs through the various selves and unites them is the Ego. Resemblance among the parts of a continuum of feelings constitutes personal identity.

"Of[2] the nature and part of *consciousness* which is the true self we can obtain no direct evidence in reflection, for this true self is that to which the increment is presented, and which itself can never be presented in reflection."

But this is the self of consciousness with which the metaphysician deals. It is that part that is sought for analysis, and is only an inference *ad infinitum*. Mr. Marshall concludes in his article by pointing out that the self *in toto* "speaks of the experience of all our ancestors, of those who were men and of man's long line of progenitors of diverse animal forms." "This self says to us 'The elements which are present in the fields of attentive consciousness represent but a paltry array

[1] Principles of Psychology, Vol. I, p. 294 *seq.*
[2] Marshall: Instinct and Reason, pp. 107-112.

of experimental effects." This sub-ancestral influence "is not differentiated by the excessive or emphatic partial activity of any part of the complex system; it is the mass of 'feeling' so called by many; it is that part of the moment's conscious experience which we are warranted in describing as the field of inattention." So the true self must "be allied with the presented 'instinct feelings' rather than with variant reason."

From the standpoint of a purely ideal system we may notice Prof. Howisson's[1] views. He does not deal with "self" perhaps so much as "mind." In fact objection might be raised as to the justification of classifying his analysis under a study of "self." He assumes that "All existence is either (1) the existence of minds, or (2) the existence of the items and order of their experience; all the existences known as material consisting in certain of these experiences, with an order organized by the self-active forms of consciousness that in their unity constitute the substantial being of a mind, in distinction from its phenomenal life."

These many minds are the determining ground of all events and 'mere' things, and form the eternal world, which he calls the "City of God." God the fulfilled Type of every mind, the living bond of their union reigns in it, by being the impersonated ideal of every mind. The members of this eternal Republic have no origin but a logical one with reference to each other, including their primary reference to God,—in the literal sense no origin in time. There is nothing prior to them out of which their being arises, but they simply are and constitute the eternal order. They are free since they are the source of all the law of this realm. This pluralism of minds is the "mover" of all things. The world of spirits constitutes a circuit of moral relationships, and its union is found in God. God has no being subject to time, nor is the fundamental relation of minds to him a temporal relation, and "creation must simply mean the eternal fact that God is a complete moral agent, that his essence is just a perfect conscience." The key to his system he says "is fixed in its doctrine concerning the system of causation." Efficient cause is reduced and final cause is substituted in its stead, *i. e.*, God is not the end but the guiding, regulative and constitutive principle of real existence.

Another view[2] endeavoring to establish the immortality of the self is that set forth by Prof. Schiller. He notes that the self as it appears is the phenomenal self and the self as the ultimate reality, the transcendental self. The phenomenal self is that part of us that changes with the flow of consciousness, the change of personalities; a knowledge of which is gained by experience and experiment, and an examination of the flow of consciousness. It is not separated from the Ego but this is the unifying part. The phenomenal self represents but a small part of the individual at any time, but the Trans-Ego is the "I" with all its powers and latent capacities of development. The self approximates in its development more and more to the Ego.

The ego is both the basis and end of development within which the selves alone are real. Pre-existence of the soul is not an illusion, it explains the reincarnations of Buddhism. The soul of man has been developed from the souls of animals through a process of evolution.

Bradley recognizes the self as follows:

[3]"The self and the world are elements, each separated in, and each contained by, experience. The self is, and likewise the soul is, an intellectual construction based on immediate experience, yet transcend-

[1] The Limits of Evolution.
[2] The Riddle and the Sphinx.
[3] Appearance and Reality, p. 525.

ing it. The self is one of the results gained by transcending the first imperfect form of experience. Experience in the early form is not yet self or not-self. Its unity gives way before inner unrest and outer impact in one."

And then self and Ego, on one side are produced by this development, and on the other side appear other selves and the world and God. These are the contents of our experience, but our experience is part of the universe. So there is no stepping over the line from one world to another. Experience is in both worlds.

For Dr. Royce:

"Self[1] is just your own present imperfectly expressed pulsation of meaning and purpose—this striving, this love, this hate, this hope, this fear,—this inquiry, this inner speech of the instant's will, this thought, this deed, this desire,—in brief this idea taken as an Internal meaning." Self is an ethical category in the sense that one selects from all the Universe a certain portion of remembered and expected life as that of his own, in contact with other selves the large individuality and the life of the Absolute. By the contrast with the not-self I am as sure of myself as of Being; our individuality is expressed by mutually contrasting our life plans, "each reaches its own fulfillment by recognizing other life plans as different from its own." "In the present form of human consciousness self is an ideal, its true place is in the eternal world, where all plans are fulfilled, it derives everything from others except its Uniqueness, God's will is consciously expressed in this."

What can we say from these definitions of self?

It is an analytic explanation, not of the present feelings but of their objectification. The word "self" is more definite than "soul;" it has no uncertain history; it is subject to analysis. We identify and know ourself. By soul we mean both the "ego" and the "me,"—the subject and the object are both included in the soul. The preference for the word self is in line with certain tendencies of thought noted in this paper, *i. e.*, a gradual tendency toward definiteness. Comparisons with the crude undifferentiated ideas of the savage, or with the less definite ideas of soul expressed during the middle ages, show a line of progress that approaches exactness and definition of idea. The "self" has arisen as a result of careful analysis. It has its place in psychology, and any study of the subject would be incomplete without it. If American psychology follows along the lines of the old English school, or if it adheres strictly to an empirical basis, then, with Bacon, "soul" may be relegated to theology. To-day we recognize various aspects of psychology, and among those the psychology of religion. The subject is not one that stands aloof from others. Since it is a study of mind and psychic phenomena in general the psychologist is brought face to face with the soul of theology and he must recognize the significance of the term and its meaning with reference to psychic life as a whole.

As has been often mentioned psychology and philosophy are often harmful to the spiritual life of the student. That one line of study should be destructive to the teachings of another, if they are both for the welfare of the the student, is not good pedagogy. The attempt of psychologists to place the subject on a scientific basis has tended to make it assume a hostile attitude. The feelings, because they are not subject to analysis, have not been given a place commensurate with the extent they influence action. A large part of what people call the "soul" is included under the term feelings. The contest is between

[1] The World and The Individual, Vol. II, pp. 272-89.

the two types of mind, the cognitive and the affective, or between cognition and feeling in the same mind; the one relating and classifying, dealing with the world of thoughts; the other acting on that cumulative heritage, the feelings. The analytic self is based more on the present objective side of consciousness, the soul includes both the subjective and objective.

Localization.

Any study of the soul-idea cannot well omit some mention of the ideas that various writers have expressed as to the part of the body in which the soul is located. The savage expresses his opinion as to where it is located, civilized man expresses his. Certain lines of progress have been made. The main line of progress keeping pace with the advancement of civilization, is the tendency to recognize the head or brain as the central organ in which the soul is located. *Pari passu* with this movement is a gradual change from the identity of soul as a life principle to the notion that it is mind. The material for this section is based very largely on a similar study by Volkmann.[1]

The idea prevailed among some of the ancients that the soul was mere vital power, as such, the blood, filling the whole body was its seat. This idea existed among the ancient Hebrews, and as a result of this they prohibited the use of blood. Psychic functions were not ascribed to the blood but to the heart, and the feelings originated from the intestines, bones, liver, gall and kidneys. The records of the Hebrews after the exile show that they located the soul in the head. References for this may be noted in Daniel;[2] contrary views, however, are also expressed. Among the Hindoos the most significant part of the soul is connected with the heart. It has been observed that localizing the soul in the head above the seat of sensuous pleasure and desire is the first step toward the thought of its immortality. Besides the part in the head most barbarous or semi-civilized peoples recognizing the soul as being complex locate other parts of the same in different organs of the body. The Persians[3] localize anger in the head, thought in the heart, and sensuous desire in the liver. The oldest reports concerning the brain as the seat of the soul point unanimously to Egypt; here the belief in immortality and transmigration was long prevalent. From Egypt Pythagoras is reported to have carried the idea into Greece. The Pythagoreans located the *nous*, or rational soul in the brain, life and sensation in the heart, seed and germination in the navel, generation in the sexual parts. According to Philolaus[4] the first of these contains the germ of men, the second of beasts, the third that of plants, the fourth that of all creatures. Alcmaeon is given the credit of having first taught that all sense organs are connected with the brain. By some he is considered the founder of the doctrine of immortality. Democritus held views similar to those of the Pythagoreans, *viz.*: that the thinking part of the soul is located in the brain, anger in the heart, sensuous desire in the liver, but the soul is extended throughout the body. Plato located the *nous* in the head, the *dumos*, passion, in the breast, the *epidumetikon*, sensuous desire, in the abdomen, the parts being distinctly bounded. The influence of certain organs which may from some cause demand undue attention tending to change the course of the individual thought, or attention to them is an important factor determining localization. This may have been due to some individual trait or tendency of the

[1] Lehrbuch der Psychologie, Vol. I, pp. 80-90.
[2] Chap. II, 28; IV, 5; II, 30.
[3] Delitzsch: A System of Biblical Psychology, p. 298
[4] Ziller: Pre-Socratic Phil., Vol. I, p. 480.

writer or teacher or to some pathological condition, thus giving undue predominance to some organs. Aristotle opposed the separation of the soul as made by Plato. For him the perceiving and nourishing parts in man, and animals having a heart and circulating system are located in the heart. In the case of those animals having no such system, the soul is located in that part exercising the function of the heart. In plants and in animals that manifest life after being cut to pieces each part may be the seat of the soul, or at least they have that possibility. The principle of motion, sensation and nourishment must be located in a middle point of the body where the exchange of blood takes place. The brain cannot be the seat of sensation because on immediate contact it is painless, it is the foulest, dampest part of the body, as opposed to the heart streaming with fire-colored blood. The Epicureans located the rational part of the soul in the heart or lungs, while the irrational was thought to be diffused throughout the whole body. Herophilas of Alexander and Galen, under Platonic influence, and also under the influence of Hippokrates, permanently located the thinking part of the soul in the brain; this they also recognized as the organ of memory. Galen ascribed to the lower soul part, that in the rump, the preparation of vital spirits. Xenocrates located the rational soul in the crown of the head, Strato in the middle of the forehead between the eyebrows. In the change of position in localization of the soul, its gradual transference to the head, can be noted the change of the idea of the soul to that of a something having to do with the mind, and in fact a gradual identification of it with the mental processes. Neo-platonic doctrine located the soul in the whole body,—entirely in each part of the same. Nemesius—following the psychology of Aristotle, locates the soul as coincident with the body, placing phantasie in the anterior, memory in the posterior, and intellect in the middle ventricle of the brain.

Gregory of Nyssa, and St. Augustine prefer a symmetrical division of the vital soul throughout the whole body; Gregory opposes locating it either in the brain or heart, while Augustine recognizes the heart as the central point of the corporeal life and involuntary motion, the brain as the central organ of sensation and voluntary motion, sensation originates in the anterior, motion in the posterior, and remembrance in the middle part of the brain.

Thomas Aquinas located different activities of the thinking soul in different parts of the brain His doctrine of location practically overthrew the Aristotelian view of the heart as the seat of the soul. The nervous system has begun to be an object of study. Cossman opposed the ancient location of the soul from the standpoint of nervous anatomy, and recognized the brain as the common sensorium of external sense as well as the immediate organ of inner sense. With Descartes the conception of the soul as a unity, opposed to the body, excluded the idea of its being separated. From his mechanical conception of the body, and his knowledge of the nervous system, he reasoned that there must be some central point, undivided, from which the motive forces of the body originate. Thus the pineal gland, as a single organ, was selected. Lancisi and Bonnet[1] located the soul in the corpus callosum, Digby in the transparent septum, Haller in the pons, Boerhave in the prolonged cord, Plattner in the corpora quadrigemini. Sommering made one of the last attempts in this direction, but he avoided the older theories of glands and certain brain parts, and pointed to the fluid in the brain ventricles—as the water over which the spirit floats or is suspended.

Leibnitz did not consider the soul to be located at any one point in

[1] Volkmann: Lehrbuch der Psychologie, Vol. I, p. 88.

the body, but thought it spread out through all the cells; Baumgartner followed out the same idea, and claimed that the soul has no place, not even in space, but that its identity is preserved through its relation to the other monads. Since the time of Kant the question has fallen into more or less discredit. In his earlier writings Kant granted that in the mind of a visionary or enthusiast there are ideas of a spiritual substance which occupy space, but do not fill it. In his later works he corrects this view. The futility of physiological attempts on the one hand, and the attention given to the dynamic conception on the other, are favorable to the idea of the whole body as the seat of the soul, with the nervous system instead of the blood as the basis. J. Müller,[1] from a study of the localization of the senses and also from studies of parts of dismembered organisms that continue to live, concluded that the soul is co-extensive with the body, but the brain the fundamental organ. Most of the school of the philosophy of identity took this view. For Fischer the unconscious soul has its seat in the organon, outside of the nervous system, the conscious soul in the entire nervous system, and in the brain as the central point in so far as the latter, as a central point, outweighs the other parts of the system. Fichte held similar ideas; in a wide sense the whole body is the organ of the soul, in a narrow sense the nervous system, for the soul is everywhere that it operates, with this modification, that definite parts of the nervous system determine definite functions of the soul, as for example one function of the hemispheres is consciousness. For Schopenhauer the whole organism is the objectification of the will, the brain that of the intellect. For the Hegelian school the category of space can have no significance for soul as subjective spirit, it is lost through the whole organism, everywhere centre and everywhere periphery. It is outside of space, and not a mathematical point. What is in the brain is at no time soul, for the soul is only subject. "The soul is everywhere and at all times for I wander with thought through all ages and through the whole universe" (Eschenmayer). Ennemoser found in the whole question as to the localization of the soul an interesting chapter in human foolishness.

Fortlage placed the question beside that of the old question of locating the earth in the centre of the universe or that of reducing things to the simplicity of the four elements. The localization of the soul as a whole, or at least the rational part of it has passed over into the question of localization of function of the cortex. Phrenology gave this a great impetus, and every disproof of the crudeness and worthlessness of phrenology led to a more thorough and exact study of the brain. Lange[2] observes that "Instead of one soul phrenology gives us nearly forty, each in itself as mysterious as the life of the soul is generally. Instead of resolving it into real elements it resolves it into personal beings of various character. Men and animals, etc., most complicated of machines are the most familiar to us. We forget that there is something to be explained in them, or we only find the matter clear when we can imagine everywhere little men over again, who are the bearers of the entire activity."

Huschke[3] taught that to the medulla oblongata, and to the cerebrum belong willing, to the parietal lobes feeling, and to the frontal lobes thinking. Carus found the original seat of the soul in the corpora quadrigemini, but there is a three-fold division of mind.

Lotze[4] considered bodily affections necessary for the soul, as these

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[1] Volkmann: Lehrbuch der Psychologie, Vol. I, p. 89.
[2] History of Materialism, Vol. III, p. 124.
[3] *Ibid.*, p. 134.
[4] Medicin Psychologie, Chap. III.

are converted into sensations and elaborated through its own action. Nerve fibres are necessary for some of the processes of the soul, for other processes organs are needed, and for some neither nerve fibres nor organ is necessary. The soul is probably located in that part of the brain where there are no fibres, because there is no central point where all the fibres meet.

For Fechner, in a wider sense, the soul is located in the entire body, in the narrower sense (that of consciousness), in a part of the nervous system; this part, as we descend the scale of the animal kingdom, increases in extent or becomes more generalized.

One of the last theories of localization is that of Pflüger.[1] By means of his well known experiment he attributed a soul to the spinal cord of the frog, lizard, etc. His method was as follows: A decapitated frog is smeared on the back with acid, it wipes the drop away with the most convenient foot; if this foot is now cut off at the thigh, and more acid placed on the same spot, after some unsuccessful attempts with the stump, it will complete the movement with the opposite foot. This process of changing he thought indicates reflection. Within itself it is no mere reflex act, so he predicated the spinal soul. To disprove the theory Goltz placed two frogs, a decapitated one and another in perfect condition in water. This is gradually raised to the boiling point. The decapitated frog makes no effort to escape, the normal one struggles to free itself. From this Goltz concludes that there is no soul in the cord.

The experimenters in these cases are not dealing with the "soul" of the middle ages, but something akin to consciousness. So with all the later ideas of localization, it is rather one of function, *i. e.*, determining precisely what a certain organ means, or contributes toward motivising the organism or to its welfare, rather than fitting a functioning, and perhaps immortal, soul on some organ. Bosanquet[2] speaks of the soul thus: "Probably most of us at one time thought that *mind* is a *thing* which thinks and seems to move the body with which it is co-extensive—without any assignable mechanism. As we begin to be educated we find out, *e. g.*, that mind is not present at the tips of the fingers where we seem to feel; that the actual skin and flesh is not sensitive, but only the nerve upon pressure of which feeling follows. A further stage of the same discovery is when he learns that if a nerve is cut anywhere between finger and brain there will not be any sensation in the finger, so that really the feeling at the finger tips is not a mistake but an illusion. Then must all remember when we found out—what Mill points out—that the will is not magical, that, *e. g.*, a numbed arm will not move. That is, the sequence of movement upon will is not infallible, is not magical, but depends upon a certain mechanism that may go wrong; we do not know whether it will really act except by trying. Experience of this kind make us withdraw the magical notion of the will from the outlying parts of the body, until in popular culture, we get a sort of idea of the soul as a little creature sitting in the brain."

This sketch shows that certain substitutions have been made in the idea of localization. An empirical mind derived largely from the senses has taken the place of the dim, mystical, idea, which was a combination of life and soul, vitality and mind, held by the ancients. This has its basis in the functioning of a normal nervous system, instead of the blood, some organ connected with circulation or digestion. The change of idea has been gradual, and has been made only with the development of science. Modern psychology recognizes the brain

[1] Goltz: Die Functionen der Nerven-Centren des Frosches, p. 110 ff.
[2] Psychology of the Moral Self, pp. 115-125.

as the organ of cognition, but the feelings and emotions are not definitely located.

In concluding this study of the soul, however barren and fruitless it may be as to exact definition, yet it is not without some results. However analytic the psychologist may be he is still hopeful, optimistic and charitable in his beliefs. Prof. James grants that the mind is immortal, Prof. Royce recognizes as immortality of the soul the survival of one's "purpose" in life, or of a certain "internal meaning." The subject matter of neither psychology nor philosophy has yet been fully adjusted to the theory of evolution. It is probable that when these are worked out on the basis of development a constructive attitude will be taken. Instead of deriving "soul" by a process of analysis the elements from which it has developed will be pointed out. It may be that the traits of character exhibited by the various species of animals are the elements from which the soul of man has evolved. Analysis alone will never fully explain what is meant. By soul the mass of people have in mind, besides the thoughts that may have aroused them, the waves of feeling that rise in them when they think of certain experiences. The feelings are the common heritage of the race, and the fact that we share a common feeling makes society possible. The soul of religion, psychology, and philosophy should be one, representing as they do two sides of the same phenomenon. While philosophy presents the cognitive side to us theology presents the side of feeling.

It is poor pedagogy to present to the student ideas along one line of thought that are destructive to a related system of ideas. Educators who have to deal with elementary and secondary education have striven to correlate different studies, that certain ones may be contributory to others, and that they may make for the harmonious development of the pupil. This principle holds true none the less for studies beyond the period of secondary education. The order in which the subject matter of philosophy is presented often does the student more harm than good. Theology and philosophy should be in harmony; the ideas of the soul derived from psychology, while they should be exhaustive, should contribute to the teachings of theology. The idea of the soul will continue as long as people desire survival after death. Our study of the subject leads to the following definitions: for educated thoughtful people the soul probably represents an ethical ideal, in a general way this may be embodied in certain principles, while the majority of Christian people refer to an undefinable mass of feelings.

FACIAL VISION: A SUPPLEMENTARY REPORT, WITH CRITICISMS.

By Professor Robert MacDougall, New York University.

In the fifth volume of *The American Journal of Psychology* Mr. F. B. Dresslar reported an investigation of a phenomenon to which the name "Facial Vision" has been given. This is the capacity to perceive the presence, and with more or less exactness to discriminate the character, of objects in proximity to the blindfolded subject. The faculty is commonly remarked in the blind, and has also been observed among persons possessing sight.

The surmise had been made by Professor James that the perception of such objects might be based upon sensations of pressure on the drum of the ear, due to changes in the movements of the air caused by the presence of the objects in question. Mr. Dresslar's experiments were first directed to this point, and after a series of tests, which seem to have been protected from all invalidating error, the conclusion was reached that the pressure sense of the ear-drum was altogether too obtuse to be considered as a factor in the phenomenon to be explained.

There remained several forms of sensory stimulation to which the presence of objects near the face might give rise, and to the analysis of these attention was next turned. Every large object by which one passes modifies the movements of the air, cutting off the wind on the one side and causing eddies and back-draughts on the other, thereby affecting the sensations of pressure on cheek and brow. It likewise disturbs the local distribution of heat by intercepting the cooling breeze and by absorbing and reflecting the rays of the sun; and by also preventing the free radiation of heat from the body it may give rise to discriminable differences in temperature sensation. Such an object, finally, disturbs the free propagation of sound-waves, intercepting and reducing those coming from the one direction and reinforcing by reflection those which come from the other side.

Any one of these factors severally, or a combination of them, may conceivabiy afford the sensational basis upon which the reported perception depends. The first two of these aspects are difficult to separate, since the organ of sense in each case is the spread-out surface of the skin. The third element, that of

sound, may readily be isolated, and it is with its function that the experiments in question are chiefly concerned.

Four frames of wood one foot square were prepared, one of which was filled in solidly, the second latticed with strips three-quarters of an inch in width with intervening spaces half an inch wide, the third covered with wire netting, and the fourth left open. These frames were arranged so that any one could be brought noiselessly to a position three inches from the face of the blindfolded observer, as he sat in a chair. The series of frames was grouped in pairs,—Solid-Wire, Lattice-Open, Solid-Lattice,—so that discrimination was limited to choice between two objects, and was thus both simplified and given definite direction.

With three observers having normal senses experiments with these combinations gave respectively 94, 68 and 90 per cent. of correct responses. Thus the ordinary person seems to have a perception of the proximity of such objects involving a fairly high and reliable discrimination of their detailed features. The observer was then seated with his side to the apparatus, and a screen was interposed between his head and the frames, in the centre of which, and opposite to the passage of the ear, a small hole was pierced. Changes in temperature and pressure sensation due to differences in the filling of the frames were thus practically shut out, yet when the experiments were repeated under these conditions no diminution in the number of correct responses appeared, the percentages being respectively 91, 80 and 93. The figures show an actual increase in discriminative power. Finally the ears were stopped with cotton and the frame presented as in the first set of tests. The preponderance of correct responses, upon which the evidence of a process of perception rests, then entirely disappeared, the percentages being now 53, 51 and 49 respectively. The evident conclusions are that a real process of perception is involved, that it depends upon sensations mediated by the ear, and that these are strictly auditory stimulations of the nature of slight changes in the character and intensity of the confused mass of faint sounds falling upon the ear from moment to moment.

These results show a very high degree of certainty in the responses under conditions where factors of disturbance would naturally be supposed to occasion a large variable error. Correct discrimination rises to above 90 per cent. of the total judgments, even between those objects of the series whose capacities to interrupt radiation and air-currents are most nearly equal. In the discrimination of double contacts upon the skin there appears a region of confused perception, the threshold of which is commonly defined to be that distance which gives rise to 75 per cent. of correct responses. That the material upon

which discrimination proceeds is present in the region immediately below this threshold appears from the preponderance there also of correct responses; but its features are submerged in the mass of subjective and objective variations to which the observer is exposed from moment to moment. By increasing the separation of the points a distance is reached at which the influence of the differential increment becomes clearly greater than that of such disturbing factors; and the valuation of the threshold, —at, say, 75 per cent.,—means simply the agreement upon a proportion between correct and incorrect responses which shall represent a satisfactory margin of preponderance in the constant over the fluctuating differences.

In the experiments now commented upon almost the whole series, exclusive of those with closed ears, gave results which lie above the threshold as thus defined. This is a surprising keenness of perception to be based upon such sensational material. The forms of sensibility upon which discrimination in such cases depends are apparently, in many instances, highly developed in the blind, and no doubt enter as factors into the total complex upon which the reactions of the normal individual are commonly based; but that they are not isolable elements, which can be identified as independent sources of perception, is shown not only by the experience of ordinary life, but also by the fact that under the special conditions of these experiments, in which attention was directed purposely to their analysis, the observers were unable to indicate any single specific sensory change upon which discrimination depended. The personal reports of the observers clearly show their hesitation in assigning the sensations by which the perceptions were mediated, for each enumerates several factors which "perhaps," or "sometimes" were, or "seemed to be" present. In two features all three observers agree, namely, in the impression that temperature changes and a "shut-in" feeling were to be noted, but one only unhesitatingly indicates variations in the auditory content as the basis of perception. But if the ear afforded the means of such exact discrimination as appears in these tables, —nine out of ten responses being correct, roughly speaking,— it is surprising that a clearer identification of the nature of the sensory impression was not made by those who took part in the investigation.

It is, I think, a fair conclusion that judgments based upon auditory material of this kind, too confused and weak to be clearly recognized, should be expected to fall in the subliminal rather than in the supraliminal region. In other words, the proportion of correct responses should be between 50 and 75 per cent., between the indifference point of guessing and the threshold of reliable discrimination.

It may seem an inversion of the natural order of criticism to challenge the high degree of accuracy presented by the reactions of Mr. Dresslar's subjects, since such judgments do, of course, shift from guesswork to unvarying correctness according as the values of the constant and variable factors vary. Nevertheless though such a percentage might well reflect perception based upon a group of co-operating sense data of different orders, no one element of which could be readily isolated, it seems too high to be justifiable on the sole basis of such an auditory factor as is described in the report. It is the interpretation of the sensory sources, not the proportion of correct responses, to which my criticism is directed. Notwithstanding the apparent conclusiveness of the final test, *i. e.*, with the stopped ears, I am convinced that throughout Mr. Dresslar's experiments other than auditory factors were significant, and that the method of excluding the latter involved concomitant changes which interfered with the process of perception at large. The curious distribution of sensory types in the two investigations is sufficient to arouse suspicion of this kind, for it is improbable that in the one should be fortuitously gathered three observers of exclusively auditory type, while the reports of all those in the other indicate the presence of additional sensory values, though not to the elimination of the sound factor itself.

In view of several considerations the present writer made a substantial repetition of Mr. Dresslar's experiments, the only difference to be noted being the substitution of the combination Solid-Open for that of Solid-Wire, which gives a slightly wider range of objective differences than were incorporated in the original investigation. Apparatus and signals were controlled from a distance (yet within the same room), and responses were given by pressure upon an electric key. Three persons took part in the investigation, all of whom had had previous training in laboratory research. Thirty judgments of the several combinations were made under each experimental variation, the members of the pairs being presented an equal number of times in every series of tests. The total number of judgments thus lay between two and three thousand.

The results confirm Mr. Dresslar's conclusions that the person of normal sensory condition and without special training is sufficiently affected by such stimulus variations as are here in question to be able, independently of the sense of sight, to detect the proximity of the various frames, and in some degree to discriminate their individual differences. The observers who took part in the investigation were of various grades of sensibility, their correct responses under all conditions bearing the following mutual ratios: A, 1.00; B, 0.91; C, 0.85.

In the case of even the most obtuse observer, however, a clear margin of positive discrimination appears, so that there is no reason to doubt the presence of a true perceptual process, based on (at least) subliminal differences in sensation.

The distracting influences noticed in the course of the work were of two types, tactual and auditory. In the early part of the investigation visual perception was eliminated by lightly bandaging the observer's eyes. The presence of this girdle being complained of, the blinds of the dark-room in which the experiments were carried on were closely drawn and the bandage removed, the observer also closing his eyes during the course of the test. The result of this change was to increase the number of correct responses from 62.3 to 71.0 per cent., all observers and experimental conditions included. Further, at the beginning of the investigation, which was carried on during the months of May and June, the windows of the room were kept partly open, in consequence of which the sounds arising from breathing movements, etc., were augmented many fold by the noises of the street near by. This also was found a serious distraction, to remedy which, first, the window was closed, and secondly, the tests were later made at midnight when streets and building were deserted. The proportion of correct responses underwent corresponding changes, as follows: Day, window open, 58.3%. Day, window closed, 62.3%. Midnight, 71.0%. Concerning these concomitant variations, which in themselves afford further evidence of the presence of a perceptual process, it is to be observed that there are two separate bearings which such changes in the physical surroundings may have upon the latter process. One is the distracting influence already spoken of, which the presence of the auditory or tactual stimuli exerts upon the attention; the other consists in possible modifications of the stimulation or of the sense organ upon which the perceptual process depends. In addition to its distracting influence the bandage about the temples interferes with the normal radiation of heat from the skin and reduces the sensitive surface exposed to stimulation by changes in the temperature or movements in the air immediately surrounding the body. The street noises, likewise, both disturb attention and modify the character and violence of the stimulation falling upon the ear. But it is also to be remarked, in considering the points of difference between this and the preceding investigation, that while in the case of the bandage the two sets of influences clearly work together, that which increases the sensory area at the same time reducing the distraction, in the case of auditory disturbances there is no such evident correlation. On the contrary, a result of the opposite character is to be expected, since the absolute differences

in stimulation caused by the introduction of an object which more or less shields the ear from impinging sound-waves must be greatest when the volume of stimulation is itself at a maximum. Since, therefore, the changes are of the same sign in both cases, and the greater increase takes place in connection with the reduction of auditory disturbances, the influence which these factors exert is to be attributed to mental distraction and not to their immediate sensory values.

The proportion of correct responses obtained from the present set of observers differs largely from those reported in the original investigation. The individual averages for all conditions tested are severally as follows: A, 54.7; B, 58.3; C, 64.0 per cent. Individual extremes for single sets of conditions range from 54.3 to 73.0 per cent. of correct responses. These proportions lie wholly within the limits which, on the whole, as was pointed out in the earlier part of this paper, are to be expected from the nature of the conditions under which perception works.

A second point to which attention may be called in connection with this investigation is the relation of the proportion of correct responses to the magnitude of the differences existing between the objects to be discriminated. The applicability of the method of right and wrong cases depends upon the fact that if the phenomenon involves a true process of perception the percentage of correct responses under any given set of conditions should be a correlate of the series of differential increments presented by the sensational material upon which it is based. The absence of such a concomitant variation indicates either guesswork or a source of knowledge independent of the sensory process.

The series of objective differences in the materials employed in the present investigation are, in order of increasing magnitude, as follows: Lattice-Open, Solid-Lattice, Solid-Open. The corresponding proportions of correct responses are, in the same order: 59.0; 62.0; 65.2 per cent. The number of correct responses varies concomitantly with the magnitude of the sensational differences to be discriminated, as it must necessarily do in any extended series in which a true perceptional process is involved. That this general average does not result from the fusion of inconsistent types of change may be seen from a comparison of the individual averages upon which it is based. These are for the three observers respectively: A., 52.3%; 56.7%; 62.3%; B., 59.9%; 59.7%; 62.3%; C., 63.0%; 67.0%; 70.3%. Thus throughout practically the whole set of judgments the proportion of correct responses reflects the series of differences presented by the objects to be discriminated, affording conclusive evidence that a true perceptual process is

involved in the phenomena. It is to be noted that though the percentage of correct responses made when a partial interruption of any sensory stimulus occurs must lie between the extremes presented by complete interference on the one hand and the absence of any reducing agent, yet in the case of sound at least there is not a quantitative proportion between the amount of physical interference and the intensity of the resulting sensation. To cover one half of the aperture, for example, does not reduce the loudness of the sound by the same amount. Re-arranging his differences in view of this fact Mr. Dresslar's results also present the above evidence of a true factor of perception.

No such essential dependence upon auditory processes as appears in Mr. Dresslar's results were found in the experiments here reported. The only departure from the conditions of the original investigation consisted in the substitution of conical plugs of soft rubber for those of cotton wool, on account of their greater impermeability to sound. The average for all observers under the three experimental conditions are as follows: Frontal, ears open, 65.7%; Frontal, ears closed, 62.3%; lateral, facial sensibility excluded, 56.7%. The highest proportion of correct responses occurs when all the normal avenues of sense are open; the lowest, unlike the results previously reported, appears when stimulation of hearing alone is permitted. The latter discrepancy, however, is of secondary importance, since it can be speculatively resolved into factors of imperfect control, etc.

The feature which cannot thus be reconciled is the fact that the plugging of the ears was followed by a decrease of only 2.4 per cent. in the correct responses made. In other words, for this particular set of observers the shutting off of auditory stimulation left the capacity to make such discriminations practically untouched. It is to be remembered in this connection that the mode of excluding auditory impressions inevitably introduced a serious factor of disturbance in the novel and unpleasant sensations due to the presence of the plug in the meatus of the ear, a factor which alone is sufficient to account for the falling off which appears in discrimination under these conditions. It seems necessary, therefore, to revise the conclusions of the previous report by recognizing that their application must be limited to such persons as conform to the special type of sensibility presented by those who took part in that investigation.

The small number of correct responses which were made in the present investigation when facial sensibility was excluded and auditory stimulation alone relied on, does not necessarily indicate that the ear plays no part,—or even, in individual

cases, a small part,—in the process of discrimination. The arrangements for this test were such that slight uncontrollable variations in the experimental conditions might conceivably interfere to a serious extent with the changes in stimulation caused by the different objects, and thus reduce the proportion of correct responses. All observers did not present the same curve in this regard; in two, discrimination was at its minimum during auditory stimulation, while in the third it was at its maximum, as follows (results being given in the order: frontal, ears open; frontal, ears closed; lateral, facial sensibility excluded): A., 56.7%; 54.3%; 58.3%; B., 62.4%; 63.0%; 56.7%; C., 73.0%; 68.6%; 55.0%. Further, Observer B., one of the former group, made the highest percentage attained in the course of the investigation during a supplementary experiment in which a large megaphone of stiff paper rolled into a cone was arranged with its apex inserted in the ear passage and its mouth brought within a couple of inches of the suspended frames. Under these conditions 80.0 per cent. of the responses were correct in a total of ninety judgments.

It thus appears that the process in question is not restricted to any one type of sensory stimulation, but may depend in different individuals, upon any one of several such sources, and in ordinary cases probably involves a combination of these. That to which, in addition to hearing, I should call attention, as likely to play an important part in the process, is the sense of temperature. The interference with the normal radiation of heat caused by solid objects in proximity to the skin results in changes of temperature at its surface that are by no means small, and I am inclined to believe that if a delicate thermometer were employed to test their fluctuations the latter would be found to parallel the variations in the proportion of correct and incorrect responses according as the object was made to approach or recede from the skin.

NOTE. Since submitting this manuscript I have been informed by the Director of the psychological laboratory at Clark University that through an imperfection in the report a misinterpretation has arisen in regard to two points of the original investigation. These are that the interspaces were of equal width with the strips in the lattice, and that no experiments were made with the screen in front of the face, it being at the side of the head in all three series.

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EXPERIMENTAL STUDIES IN MENTAL DEFICIENCY: THREE CASES OF IMBECILITY (MONGOLIAN) AND SIX CASES OF FEEBLE-MINDEDNESS.

By F. KUHLMANN,
Fellow in Psychology, Clark University.

I. INTRODUCTORY.

There is one great need that every reader in this subject, I think, feels; that of accurate descriptive terminology. Many attempts, indeed, have been made to devise a satisfactory classification of all grades and kinds of cases of arrested development and thus arrive at an accurate and uniform terminology that would be really descriptive. It is singular that we have not come nearer to a solution of this difficulty than we have. We have a variety of different classifications, based upon different principles, and combinations of principles, and not one of them is uniformly followed by many writers. The division into idiots, imbeciles, and feeble-minded, according to the *degree* of general development, is perhaps the most common. And yet, even at present any one of these terms is applied as descriptive of all degrees. This mode of procedure is most unfortunate. It has made chaos of much of the literature. For, as a rule, no, or very little general description is given of the cases, so that the reader can form no idea of what sort of a case the writer is dealing with. Particular statements then in regard to his memory, attention, association, and what not, convey but little information, and meet with various contradictions, because they do not hold true of all degrees of defects. After some considerable reading, and a little first hand experience with this class of defectives, I am not convinced that an accurate classification, based upon the degree of general development, is not possible. In fact, I believe that it is, and that the experienced hand can make a further division into low, middle, and high grade idiots, imbeciles, and feeble-minded, without any serious blunders in the actual classification of cases. At any rate, such a classification is extremely desirable when it comes to a comparison of results from different cases. It is the only means to accuracy. The objection to this demand, that it is superfluous, in that when we have the results, the observations on a case, these will themselves show to what grade he belongs,

is largely theoretical only. In actually working with a case and becoming thoroughly acquainted with him we learn much more about him than our recorded results will show. We make our judgments unconsciously, from a mass of data that we lose through not getting it recorded. Thus it becomes comparatively easy to classify a case from first hand evidence, hard though it may be from mere description.

The sources from which our information of the characteristics of children arrested in development has been gathered have been various. In the older literature 'interesting stories,' accounts given by relatives and friends of the case, accounts gathered by courts, when the subject came into conflict with the law, have been pressed into service as trustworthy observations. Another distinct source of information has been the observations gathered by physicians from parents and relatives, when the case was sent to a special institution for training.[1] But by far the larger portion of the literature is based upon general observations made by physicians and instructors on a large number of cases in these special institutions. These methods have been supplemented by a procedure approaching the experimental. A few men have worked out question schema, answers to which would give information concerning the case's early life, his relatives, his early school training, as well as questions directed to the determination of his memory, his general stock of knowledge, his general intellectual capacity, etc. Seguin and Voisin have each worked out a set of 'analytical questions.'[2] Sommer has constructed a more general 'Frage-Bogen' intended for use in the diagnosis of different forms of insanity and arrested development.[3] Möller has done the same on a more extensive scale in a question schema intended only for the latter class of defectives.[4] He claims it to be the here-to-fore needed special method for the determination of the different grades of defectives. Sioli has also constructed one, based on Sommer's, but much more extended, and intended only for cases of arrested development.[5] Finally, a few experiments have been made.[6] These ways of procedure, for most of them hardly merit the name of method, need perhaps no special criticism. Whatever method gives us the in-

[1] Most institutions require application blanks to be filled out, giving answers to questions directed mainly to the history and nature of the case.

[2] Given by Sollier: Psychologie de L'Idiot et de L'Imbecile. Paris, 1891, p. 21.

[3] Sommer: Lehrbuch der psychopathologischen Untersuchs-Methoden. Wein, 1899.

[4] Möller: Ueber Intelligenz-Prüfungen. Berlin, 1897.

[5] Allg. Zeitschr. f. Psychiat., 1900, p. 113.

[6] See Appendix and Bibliography below.

formation we want, and with the least effort, is the best. I wish to say a word only about two,—general observation, and the experimental. The relative merits of the two are the same in mental pathology as they are in other fields. We have not yet learned all about the psychology of arrested development that we can by general observation. But what we have learned in this way teaches us at least two things. First, that general observation cannot take us very far without such a degree of refinement as to make it practically the same as the experimental procedure. Secondly, it has taught us enough about the nature of this class of defectives to know that there must necessarily be a large gap between the kind of experimental tests we would wish to make, if we could, and those that we can make, considering the nature of the subjects. One illusion, then, at least, is removed. The experimental enthusiast must learn first of all, that any pre-conceived plan of experimentation that has been the result of his training in a psycho-physics laboratory is doomed to fail. It is of course important to know that a case cannot perform a certain task set him in an experiment, and the determination of the reason why he cannot is still more valuable. But this does not give us the information for which the experiment was devised, and is to that extent a failure. In general, two principles must guide us in determining what kind of a test is to be attempted. First, the nature of the individual case, his grade of general development, and his special characteristics. Second, the particular tasks that he has learned to do somewhat as a matter of every-day life, or school training. To these latter the experiments must be attached as a modification, so adapted as to give us the information we desire.

Before entering into the statement of the results of the tests I have made, I shall give a general description of each case. The sources upon which this description is based are the physician's records, taken from descriptive applications of each case, required by the institution before a case is admitted, and secondly, my own notes taken from general observation during the four months in which the tests were made. The family histories of these cases, as given in the case-book records, were considered with respect to the possible etiological factors that produced the arrest. They presented nothing that is unusual to such histories; nothing that other studies on large numbers do not show much better. The records for these few cases will, therefore, not be given. Their physical measurements were also carefully taken. The results show no striking abnormalities, and are quite in harmony with those of more extensive studies, which show that these defectives are, as a class, a few inches lower in stature, and several pounds lighter in weight

than normals, on the average. In the following section, therefore, there will be considered only matters concerning their general mental development.

II. GENERAL DESCRIPTION OF CASES.

In the following general description of cases the first part for each case, that under "At time of admission," is taken from the physician's records. The second from notes on my own observations. Cases A, B, and C are those of the Mongolian type.

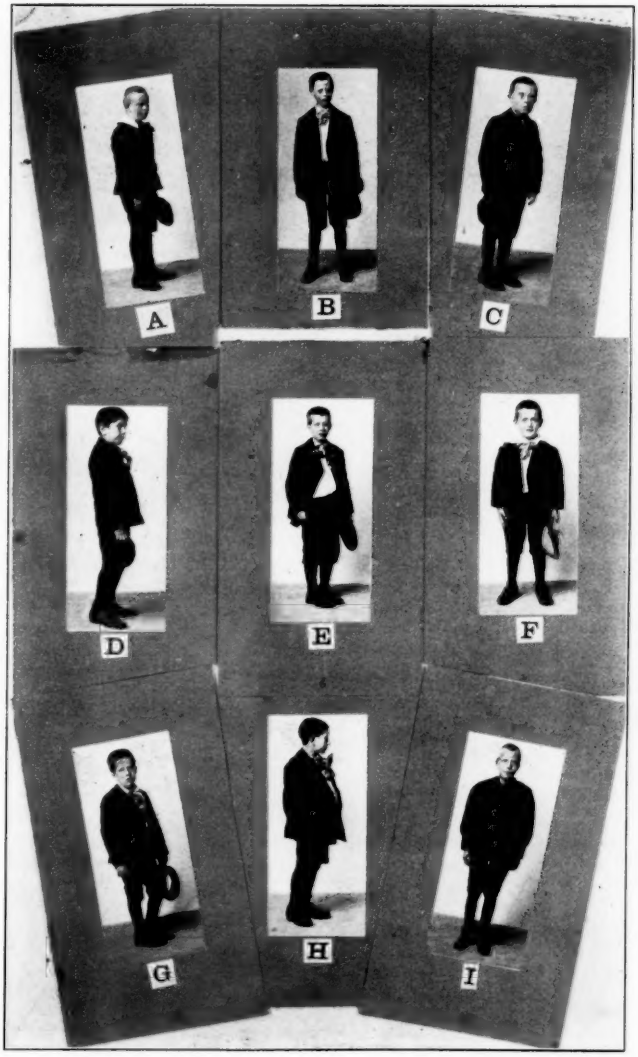
CASE A.

At Time of Admission.

At the time of admission into the institution A was seven years three months old. The first observed signs of mental deficiency were the usual ones in most cases of arrested development. His reaction to common stimuli was retarded. 'He did not notice fire, light, or heat, and was always very quiet.' He began to walk at two and a half years. His habits of cleanliness are, at the time of admission, fair. He has learned to wipe his nose and mouth, and does not soil clothes when in health. He can partly dress and feed himself. Puts on stockings, but cannot tie shoe-lace in regular knot. He can use a fork and spoon, wipe and put away dishes, pick up stones and apples, shovel snow or sand, string buttons and beads, swing child in a hammock. He amuses himself with blocks, marbles, building piles, riding girl's bicycle, looking at books. He is fond of music, recognizes color, and probably knows red, green, and yellow by name. He distinguishes cubes from bricks and pictures so as to know them. He usually understands a command and can do an errand. He talks a little, but is limited to the use of eleven words. There is no speech defect.

Present General Observations.

A is now eleven years, having had four years of institutional life. In degree he should probably be classed as about a middle grade imbecile, and he is a fairly good example of the *stupid*, as opposed to the *active* type. In his general movements he is usually slow and clumsy. In his dullest and least energetic moments he shows every sign of chronic laziness. When busy with a task at the table, he soon collapses from a sitting posture, dropping head and hands upon the table, and forgetting his work. In the different tasks the mistakes he makes seem due not so much to an inability to do the work itself as to a lack of inclination. The effort required seems too much, and he works away in the laziest possible manner. On his brighter days or moments he may become more active, and get even a normal degree of life and energy into his movements. When in this mood he may perform his task with interest, and some degree of attention, varying with the kind of work; for he has his likes and dislikes. A lively mood, however, does not always result in interest and attention to the particular task to which he is set. The extra energy may manifest itself in other directions, in his 'own occupations,' such as humming, pounding on the table, rolling and running after the ball, in a test on throwing at a target, etc. In these instances his attention may go to anything but the thing he is told to do, and when thus engaged in something else it becomes exceeding difficult to divert his attention from it.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As a test of general mental ability, and whatever else it might show, two weeks were spent in teaching him the game of dominos, the first week with myself as one of the players, the second with myself as observer and with one of the other cases as the second player. Only blocks as high as the double four were used. He had previously learned to discriminate nearly all in a set as high as the double nine, by having one block at a time placed in a circle of ten from which he picked the same block as the one placed in the centre of the circle, two sets of dominos being used in the test. His first difficulty in learning to play the game was in learning to separate the two ends of the block and match by ends only, instead of by blocks, as he had been doing. But after the first few days he had learned all of the purely mechanical procedure of the game. He learned to take three blocks at the beginning of the game, to play by matching an end of his block with one end of the playing line, to wait his turn to play, to draw when he could not play, and to understand that the one who had disposed of his blocks first had beaten. But that he really understood these matters was gleaned from only occasional evidence, evidence that was the exception rather than the rule. About half the time he would not take his three blocks until told. Between fifty and seventy-five per cent. of his plays were wrong. Frequently he would not wait his turn, but keep on playing, his interest being apparently more in stringing out a line of blocks, than to wait his turn, play, and win in the game. He nearly always forgot one end of the playing line, and drew at once when he could not play on the end nearest him. He very frequently overlooked one end of his blocks that would play, and drew unnecessarily. Generally he showed no signs of interest when he or the other player got through first, until he was asked who won. Then he was in most cases interested, especially when he was the winner, in which case he might even laugh and applaud. He very rarely remembered whose turn it was to play first at the beginning of a new game, but generally said "mine" when asked. In general, he showed little interest in the game, none apparently, except in the mere stringing of blocks into a line, possibly some in matching, and most in his recognition of his having won. He plays at random, with little attention to seeing whether he plays rightly or wrongly. He shuffles and pushes about his blocks, knocks them over, and gets them mixed with those of the playing line and of the "bone yard." That it might be to his disadvantage to let the other player see his blocks he never learned, as he did none of the other points of the game.

CASE B.

At Time of Admission.

B was admitted at the age of eleven years two months. His abnormality was first noticed at eighteen months, in backwardness in learning to walk and to talk. He began to walk at four, to talk at about six. At the time of admission he does not know enough to wash or dress himself, cannot tie a shoe-lace, but does not soil his clothing. He can feed himself; uses a spoon, but not a knife or fork. He can do no work of any sort. He does not hide things, but breaks and tears them like any very young child. He is not always obedient, but about like a child of four. He is good tempered, except when crossed. He plays with a sled, and, in the house, plays 'moving,' collecting a pile of things in a corner. His hearing is good, but he is very near-sighted. He is fond of music, does not recognize any of the colors, does not know round from square, but can distinguish photos of friends. He can understand very simple language, and a command,

and will do an errand. He talks a little, but pronounces words indistinctly. Uses only short sentences, never putting more than three words together at a time. He does not count.

Present General Observations.

B is now fourteen years nine months old, with three years seven months of institutional life. Not counting the difference in age, he stands quite noticeably above A in general ability, but would come under the imbecile grade. He is normally active and vigorous in his movements. Among the different tasks given him he showed decided likes and dislikes, working with enthusiasm at times, while at others he persistently refused to work at all. His attention seemed to be good when and where his interest was not lacking. Occasionally he would work for a whole fifteen-minute period with practically no distraction. In these instances he would proceed with every sign of deliberation, and apparently never made a *careless* mistake. In memory tests in which he had to choose a card or picture previously shown from among others before him, he would refuse to choose by mere guessing when he had forgotten, and would in these cases not choose any at all. At the times when he was not interested in his work his distractions were due more to his 'own occupations' than to distractions in his surroundings. Yet, the latter, too, were abundant. These 'own occupations' with him were numerous and various, and very difficult to break up, so as to make him return to his work. Some of them were so constant as to deserve the name of 'tics,' so well known in pathological literature, although most of them did not last throughout the four months of observation. Only the habit of making snorting sounds, and of spasmodic laughing remained permanent. Others would appear only a few times, or for several days or weeks, and then cease. But nearly every day one or two would turn up.

The same attempts were made with B in teaching him the domino game as with A and all the others, excepting C. He had also had the previous domino discrimination test. The ability that he attained in it, and the general character of his playing were so much like that of A that they need little special description. His first difficulty, too, was to learn to match by ends instead of by blocks. He, too, readily learned the mechanical procedure of the game, but always played wrongly oftener than correctly. His interest seemed, too, to be in stringing out a line of blocks, perhaps some in matching, but most in winning. He forgot less often than A to watch both ends of the playing line, and had to be asked less often at the end of the game who won, before he recognized the fact.

B's speech has apparently not developed much since admission into the institution. He still speaks indistinctly and brokenly, and uses only phrases or very short sentences.

Case C.

At Time of Admission.

C was admitted at the age of ten years. It was noticed from birth that he was backward in every way; was helpless and could not sit up, but began to improve after the second year. He began to walk between four and five years. At the time of admission he does not yet talk. He 'can say some sounds, but cannot connect them. Says papa, mamma, baby, and a great many other words, but not very distinctly.' His habits of cleanliness are good. He does not soil clothing. He can dress and feed himself. He uses a spoon, knife and fork, but cannot tie shoe-lace in a regular knot. He 'can wash and wipe dishes,

and put them away; bring wood and coal, and other wants about the house.' He is obedient and of good temper. He amuses himself as a normal child would. His sight and hearing are good, he likes music, does not recognize colors, knows none by name, and does not recognize form. He distinguishes pictures, understands a command, and can do errands.

Present General Observations.

C has been in the institution for ten months. He is fairly active and lively, more than A, but not as lively as B. His interests seemed about uniform for all the tests. He never showed signs of any particular enthusiasm, nor of any great dislikes for any of his tasks at any time. From outward appearances his attention was not very difficult to get or to hold. He would generally react at once when spoken to, or when otherwise indicated to him what he was to do, provided he understood. And he would go through any of the tests without much relaxation in interest or effort. But upon more detailed observation it became evident that neither his interest nor effort was, as a rule, very great. He performed his tasks in a thoroughly mechanical way, with little change in manner. He did not understand many of the ordinary questions asked him in connection with the tests, but answered all with an ever ready 'yes' and nod, often before the question was completed. Many instances in his procedure showed that a large part of the time he had forgotten just what he was to do, or at least that he did not have his attention on it at all. He did not have any pre-occupations intense enough to hinder his work very much, nor did he seem to be distracted much by his surroundings. In a word, he seemed to have no particular interest in anything, and perhaps never showed any great effort. His speech was limited to some words that were hardly spoken intelligibly. He was never observed to use more than a word at a time. Many things about the tests he could not be made to understand, and the nature of his reactions to questions quite strongly indicated that the main factor in not understanding them was his lack of attention to them. When confused or astonished his eyes revealed a considerable degree of lateral nystagmus.

CASE D.

At Time of Admission.

D was eight years eight months when admitted. He began to walk between two and three years, to talk at about six years. He 'has a great laxity of vocal organs, speaks very indistinctly, so that strangers do not understand him.' At six months he had an epileptic attack which increased in severity till three to four years when remedied. Since that time it has greatly improved so that he no longer becomes unconscious, and a word will bring him back to normal condition. His habits of cleanliness are fair. He is learning to dress himself quite well, but cannot tie shoe-lace. He can feed himself with spoon, but does not use knife and fork. He can help clear table, and brings in wood up a flight of stairs. He is generally obedient and good tempered; does not hide or destroy things. He amuses himself with pictures and games with his sister. His sight and hearing are good. He is very fond of music. He distinguishes forms and colors, and knows red and blue by name. He distinguishes pictures, can understand a command, and do an errand.

Present General Observations.

D has been in the institution a year and six months. He should be classed above the imbecile grade. He is quite lively and frequently

gives the impression of one of the active type. But his apparent great activity is rather due to a considerable nervousness. He has his likes and dislikes, the latter of which he frequently expresses. But on the whole he is obedient and will perform his task when told to, even though he dislikes it much. In some of the tests he shows a keen interest. He had a strong sense of rivalry, and could not bear to have his opponent beat him. But, although rivalry aroused him very much, it did not improve his attention to his task, and consequently he did no better on account of it. He manifested more than a normal degree of inquisitiveness, with respect to matters incidental to the tests and what they suggested to him. In some of his questions he was very persistent, and frequently refused to continue his task until he was answered. A number of them were repeated every day with no apparent decrease in interest. He found much more means of amusing himself during unoccupied moments than any of the preceding cases, and he would never sit still, doing nothing, when left to himself. Of this much was stereotyped, for he did the same things over and over again with no apparent change in procedure or interest.

D had no difficulty in learning to play the domino game. He learned to match by one end only, and all the other details in the procedure during the first half hour sitting. He showed considerable interest in winning, and apparently kept that object more or less in mind while playing. He understood that drawing was prejudicial to winning and would be much pleased when his opponent was obliged to do so. He very rarely made a wrong play, but very often drew when he could play on either end, and constantly forgot one end of the playing line, drawing at once when he could not play on the end nearest him, without looking at the other. He could not be made to understand that showing his blocks or telling his opponent what he had might be a disadvantage, and he never learned any of the other points of the game. When his opponent played a double leaving the ends the same as those for which he had just drawn he forgot about the fact and proceded to his own blocks before drawing again.

Case E.

At Time of Admission.

E was admitted when eleven years three months old. He began to walk at fourteen months, and could walk alone at sixteen months. He began to talk at three years, but does not speak normally plain at the time of admission. His habits of cleanliness are good. He can dress and feed himself; can button his front buttons, but not those in the back, nor tie a shoe-lace; uses spoon, knife and fork well. He can feed the chickens, carry wood and coal. He is obedient and very good tempered, and amuses himself like normal children. His sight and hearing are good. He is very fond of music, recognizes color, form somewhat, knows black, white and pink by name, and distinguishes pictures. He understands commands perfectly and can do errands. He knows the alphabet, but makes mistakes. He read a little at school, and can count to about ten.

Present General Observations.

E is now twelve years ten months old, with one year seven months since admission. He stands above the imbecile grade. His movements and general behavior are quite normal. He is active and lively, talks freely and asks many questions, such as any normal child several years younger would ask. He is of the delusional type, frequently met among feeble-minded. He believes himself to be particularly bright, thinks none of the other boys can do things so well as he, that he is a

special favorite, that advanced work is given him because he belongs to a higher class. His one constant interest is closely connected with this attitude towards his abilities. Throughout four months of experimenting a certain set of questions and remarks relative to this estimation of himself were repeated almost daily. Occasionally he expressed dislike of some of the tests, but he was in general obedient, and never refused to go through a test when asked in a kindly way whether he would not do so. Like B, E sometimes gave evidence of what seemed to be very attentive work. He would proceed slowly with apparent care and deliberation, stopping long to consider when in doubt. But as will be seen later, these manifestations were no true index of his real powers of attention.

In learning the domino game he showed no appreciable difference in ability and characteristics, in the number and kind of mistakes he made, from that of B. Repeated attempts to make clear to him some of the different points in the game, outside the mere mechanical procedure of drawing and matching, all resulted in complete failure. He was perhaps more pleased than D when he won, but he did not show so much evidence that he kept that purpose in mind while playing, and he also frequently did not recognize that the game was ended when it was.

Case F.

At Time of Admission.

F was four years one month, when admitted. His deficiency was noticed at six months. At the time of admission he does not yet walk, but is just beginning to talk. His habits of cleanliness are poor. He cannot dress or feed himself, cannot use a spoon. His sight and hearing are good.

Present General Observations.

F is now eight years seven months old, with four years six months of institutional life. He is a typical case of the active type, as opposed to the dull, stupid, to which A belongs.[1] He shows more life and energy than any of the other cases. He throws very swiftly with the ball, runs wildly after it, kicking and rolling it about. Placed in a chair during a test, his hands, feet, and body are in a constant wrangling motion, and to sit perfectly still for even a small fraction of a minute is absolutely impossible. In his constant wrangling he soon pulls a table-cloth off the table, mixes up dominos, cards he is using, pushes or knocks off accidentally everything in his reach. His questions are very numerous, occasioned by a variety of things, and show no constant or coherent interest. They are kept up at a uniform rate independently of answers given, for which he seldom waits, and in which he manifests no interest when given. His interests, in general, in the different tests, are uniformly poor. He shows an almost absolute lack of persistent effort in all of the tests. His attention is aroused by everything about him that he sees or hears, and is as readily distracted by the next thing that his surroundings or fancy supplies. This is the one source of constant attraction and distraction that makes it utterly impossible to keep him down to any particular task for more than a few seconds at a time.

To go through the regular procedure of a domino game proved to be beyond F's attainments; not perhaps because he did not understand the game, for occasional evidence showed that he probably understood as well as any of the other cases, but because he was incapable of hold-

[1] See Kraepelin's classification, Klinische Psychiatrie. Leipzig, 1899. p. 573.

ing his attention down to the requirements, and to keep in mind what he was to do and not to do in each case. As a rule, he showed no interest in either the procedure or in winning, yet a few times he applauded loudly when he won, and got angry when his opponent won several times in succession. Over half of his plays were wrong, although he could discriminate the blocks well enough. The idea of adding a block to the playing line from his own was apparently the main thing in his interest, with that of matching as only a secondary matter. Often he would not wait for his turn to play, or play several at a time; would draw at any time merely for the sake of drawing, and constantly overlooked one end of the playing line and draw unnecessarily.

Case G.

At Time of Admission.

G was admitted at the age of nine years three months. He began to walk at three years, and to talk at four. No abnormality was noticed until the sixth year, when he would get angry easily and bump his head. He showed no tendency to play with other children, and preferred being by himself. At time of admission his habits of cleanliness are fair. He can dress and feed himself; can use spoon but cannot tie shoe-lace. He brings in wood, helps his father feed stone-crusher, hoes, etc. He does not destroy things, but is disobedient, and his temper is not the best. His sight and hearing are good. He recognizes colors, and knows most of them by name. He recognizes pictures, but not form. He can understand a command and do errands.

Present General Observations.

G is now eleven years six months, having been in the institution two years three months. He is fairly active and lively, but rather awkward in his movements. His running and throwing is like that of a child at least several years younger. He is very quiet, never asks a question and seldom speaks; is very obedient and well behaved, at least in the tests. He never protested against any task, and would persistently keep up a test for about an hour without objection or any great lagging in effort. His interest was quite uniformly good, although he had some preferences. From all general appearances his attention seemed better than that of any of the other cases, and he was capable of putting a considerable degree of effort into his work.

He learned at once the procedure in the domino game and never made a mistake in matching. He remembered at the beginning of each game whose turn it was to play first, understood that drawing was prejudicial to winning, was always much pleased to see his opponent draw and himself to win. He could watch his opponent, correct his mistakes, and direct him in his playing. But he drew unnecessarily about as frequently as D and H, by overlooking blocks that would play on either end, and by overlooking one end of the playing line. He could not be made to understand any of the points of the game, beyond the mere mechanical procedure.

Case H.

At Time of Admission.

H was ten years five months when admitted. He began to walk at about five years, and to talk at about the same time. At the time of admission his speech is normal, with the exception of a 'sort of a lisp.' His habits of cleanliness are good and he can dress and feed himself; can use spoon, knife and fork, but cannot tie a shoe-lace well. He is

obedient and good tempered and does not destroy things. His sight and hearing are good. He recognizes form and color, knows them probably by name, and distinguishes pictures. He understand a command and can do errands.

Present General Observations.

H is now eleven years five months, with one year since admission. He is normally active and lively, talks freely and asks many questions. He is of a happy disposition, laughs much and is hard to anger. He is interested in the 'why and wherefore' of things; wants to know what the apparatus is for, what the different tests are for, why notes are taken, etc. His interests, in general, are fairly good, and quite regular. He seldom objected to a test, and when he did it was rather in the attitude of a joke; he could always be persuaded to perform his task. He was pleased to get things right. His attention could be called to his work with a word. He was not very readily distracted and was fairly persistent. Like B, he, as a rule, refused to do guesswork and did not choose a picture or card at all when he had forgotten which one it was, rather than to choose at random.

He was very fond of the domino game, and wanted to play it first every day in preference to any of the other tests. His proficiency in it and the readiness with which he learned was about the same as that of G. He understood that drawing lessened chances for winning, was always pleased to see his opponent draw, and wanted to replace those that he himself drew if they did not play. He readily learned to manage the precedure of the game alone, corrected his opponent's mistakes, seldom made mistakes in matching, but overlooked one end of the playing line and his own blocks in drawing as much as G. His interest seemed to be rather in the procedure with the game than in winning, for he frequently gave no sign of interest in the latter at all.

Case I.

At Time of Admission.

Case I was seven years ten months when admitted. He began walking when a year eight months old, and to talk at about two and a half years. The first observation of defect was that of a convulsion at six months. His habits of cleanliness are fair. He can feed, and undress himself. He uses spoon, knife and fork, but cannot tie a shoelace. He can do little errands about the house, is generally good tempered, and usually obedient, but breaks his playthings. His sight and hearing are good. He sometimes recognizes color, knows red and blue by name, and distinguishes form and pictures. He understands a command, and can do errands. He does not speak plainly.

Present General Observations.

I is now ten years five months old, having been in the institution two years seven months. He is very active and lively, but the activity is of the nervous sort, for he is exceedingly nervous. During the first few weeks he was very quiet, and apparently quite attentive. But upon better acquaintance he turned out quite different. His interests are uniformly poor. He is indifferent to all of the tests, even to those that the others liked well. He never protests, excepting a constant complaint that he is tired, and goes through all with about the same degree of effort, which is very small. A word is generally sufficient to call his attention to his task, but he works exceedingly carelessly. All questions that are asked him receive the same affirmative answer, which is given generally before the question is completed.

There is also abundant evidence of another sort that he does not understand the questions at all through lack of attention. His speech is quite defective. His sentences are limited to three to four words, which often begin with an explosive expulsion of the air in the first word.

He had difficulty in learning to match by ends instead of by blocks in the domino game. All the other points in the procedure he learned quite readily. But as in the other tests, he was very careless, and made very many wrong plays, and seldom kept watch of both ends of the playing line. He seemed to regard the game rather as an imposed duty than as a pleasure, although he showed some interest in winning.

With the cases whose speech was good enough to make their answers intelligible, D, E, F, G, H and I, some time was spent with general orientation questions, similar to those outlined by Sioli, and others. The results obtained with this method were so much alike for the different cases that they may be summarized briefly. It is difficult to determine in this way how much they remember of their past life, and whether their memory in this respect is really defective, and to what degree. But one thing seems to be true of all of them as regards memory. There is a very prominent deficiency in keeping fact and imagination apart. Apparently they relate as actual fact whatever comes into their minds. For the same questions asked on different days receive different answers. Their natural train of associations, unhampered by any voluntary inhibition, determines, in general, what they have to say. Numerous special instances reveal this fact quite clearly. Thus, *e. g.*, when asked what they had for breakfast they may relate a large list of things, including anything they had at another time. It is impossible, of course, to determine just how much this mingling of fact and imagination is conscious or unconscious with them. Yet it is clear at once that probably a large part was more or less consciously done. For, on cross-questioning they would correct their previous remarks. Questions on time orientation revealed that they kept very little track of the days, weeks, months, seasons, etc., and that holidays, and events emotionally connected with their lives furnish by far the chief landmarks, if not the only ones, in their knowledge of the progress of time. Further, they showed that they knew many more names and words than they knew the meaning of, for they constantly misapplied them. This, however, differed much for the different cases. When asked to name the seasons of the year, *e. g.*, they may answer, 'Tuesday, Winter, Fourth of July, and April.' Or asked what month it is they may answer with a day of the week, a season, etc. Their idea of number is exceedingly poor, and questions involving it generally received answers very far from correct. Thus, they may say that there are two hours in a day, twelve weeks in a month, four months in a year, etc. None of them could tell time by the clock, nor had any means of indicating that they had even as much as a very vague idea as to how much of the day was past, and how much was left.

III. EXPERIMENTAL RESULTS.

A. Memory.

The tests that were made that would come under this heading were primarily intended for two purposes. First, to determine what the proper method would be for getting evidence that would decide the essential problems that such tests in

general aim at, and, secondly, to get results from the particular cases studied for the sake of comparison with other results.

A large share of the interest in the psychology of arrested development has been directed to the *memory* of this class of defectives. Remarks from casual and general observation on this matter, however, are so general and so various that they afford us but little insight into what the facts may be. The range from profound idiocy to the slightly feeble-minded is so great, the special aptitudes seem to be so common and so marked, and our present knowledge of the class so meagre, as to allow of practically no generalization. Again, the results on the memory span obtained under experimental conditions cannot be compared directly. The methods have been different, and generally too little information is given us as to the age, special training, and the approximate degree of general development of the cases. The following is a résumé of the results of previous experiments on their memory.

Galton tested the memory span of idiots with the reading of figures.[1] He probably uses the term 'idiot' as descriptive of the lowest grade. Their age was 'apparently from sixteen or seventeeen to twenty-five. They could read and write a little, and do some house work, but failed in the adding of two figures.' He tested fifteen cases, reading the figures once distinctly and having the case repeat them orally. He does not state how many individual tests were made on each case. The average of his results from these cases is four, as the number of figures that were perfectly recalled. The three poorest had an average of two figures, and of the six best five had an average of five figures, and one of six. The results of another visit to another institution, where most of the inmates were of the imbecile grade, were as follows: 28 cases tested, classed into four groups according to the estimated degree of general intelligence. In the lower classes letters instead of numerals were read, in all the child beginning to repeat immediately after reading. Class I, ages nine to fifteen, gave an average of 7. Class II, ages nine to sixteen, averaged 4.5. Class III, ages eleven to nineteen, averaged 3.09. Class IV, ages eleven to fifteen, averaged 3.33.

Johnson experimented with seventy-two cases, using the reading of numerals as a method, the child repeating orally immediately as many as it could.[2] He used series of three, four, etc., to eight numerals. Six repetitions of each series constituted a test. Of the seventy-two cases thus tested,

70 repeated 3 numerals correctly.
66 " 4 " "

[1] Mind, 1887.

[2] Psycho-Asthenics, Vol. II, No. 2.

51	repeated	5	numerals	correctly.
27	"	6	"	"
14	"	7	"	"
4	"	8	"	"

Arranging the cases according to the degree of their general development, he concludes that 'there was generally an increase of memory with intelligence, but there were notable exceptions.'

Wylie has tested fifty-one cases on visual and auditory memory, and thirty-four on the memory of muscular movements.[1] The age of the fifty-one cases ranged from fifteen to thirty years. Twenty-five of them were boys. Of the thirty-four, seventeen were boys. He gives no further description. For the visual tests he used three series of stimuli. (1). Ten cardboard forms. (2.) Ten colored papers. (3.) Ten consonant letters on cards. Five of each series were presented to the child for two seconds, and immediately it picked out as many of them as it could from a duplicated series of ten placed before it. Each series was repeated five times. He found the average number of correct choices to be as follows:

	Form.	Color.	Letters.
Girls 26	2.3	2.4	2.5
Boys 25	2.5	2.3	2.7

For the auditory test he used, (1.) groups of five nonsense syllables, as free from association as possible. (2.) Groups of six associated words. (3.) Words making sentences, from their school readers from five to thirty-five words in length. The syllables and words were read at the rate of one per second, the child repeating them immediately. The average number of syllables and words correctly repeated were:

	Syllables.	Words.	Words in Sentences.
Boys	2.1	3.9	10
Girls	2.1	3.7	12

In the test on the memory of muscular movements a graduated rod with two stops was fixed on supports before the child. With closed eyes the child moved the index finger from first to second stop and back. The second stop was then removed, and the child required to move finger again to the position where the second stop had been. Three distances between stops were used, 100, 200, and 300 mm., respectively. Three intervals, 0-seconds, 10-seconds, and 20-seconds, between first movement and reproduction of movement were used. He does

[1] See Psycho-Asthenics, Vols. I-IV, for a number of different experiments made by him.

not state the number of trials for each case. His results are:

	0-sec.	10-sec.	20-sec.
Boys 17	108	111	144
Girls 17	108	113	108
Boys	311	279	271
Girls	287	282	277
Boys	490	463	447
Girls	476	457	456

Grouping these cases into three classes according to degree of general development shows their memory span, and accuracy of memory of muscular movements parallel with the degree of intelligence, in a general way.

Recently, Lobsien, also, has made a memory span test on mental defectives.[1] He used nine stimuli, given to a group of children at ten seconds intervals, for each of eight different classes of stimuli, as follows: (a.) Nine objects seen. (b.) Nine noises made. (c.) Nine numbers called. (d.) Nine words called suggesting visual imagery. (e.) Nine words called suggesting auditory imagery. (f.) Nine words suggesting tactual imagery. (g.) Nine words suggesting emotions. (h.) Nine words whose meaning was not known to the children. The experiment was a repetition of one he had previously made on normal children.[2] In each case the children wrote down immediately as much as they could remember. He compares the results of normals and defectives. The following is taken from his tables. The figures express percentages correctly recalled.

	a	b	c	d	e	f	g	h
Defectives (age 10–12),	71	43	26	39	24	35	31	8
Normals (age 10–12),	87	54	64	61	59	61	51	11
Difference,	16	11	38	22	35	26	20	3

His results, when grouped according to grade of general development, also show that memory span decreases with this grade.

A number of other experiments have been made by different persons on the memory span of normal children and of adults. Comparison of these results with those from children arrested in development shows the latter to be considerably deficient in memory span, at least in the averages, and granting that no other factors have entered with the one class. Thus Johnson, on comparing his results with those of Jacobs, Bolton, and Bourdon, concludes that 'the feeble-minded fall considerably

[1] Lobsien: Einige Untersuchungen über das Gadächntiss bei Schwachbefahigten. Die Kinderfehler; Zeitschr. f. Kinderforschung. Bd. VIII, H. 4.

[2] Lobsien: Experimentelle Untersuchungen über die Gedächtniss-Entwickelung bei Schulkinder. Zeitschr. f. Psych. u. Phys. d. Sin. Bd. XXVII, 1902.

below normal children in memory span. But the memory span is so good in some cases, and the average for the majority is so high, that we are led to conclude that the degree in which the memory span of feeble-minded falls below that of normal children is not commensurate with the degree in which the feeble-minded fall below normal children in general intelligence.' He believes that their deficiency in memory span is largely due to deficiency in attention and will power, and that 'hence we may conclude that weakness of memory, physiologically speaking, is not a special prominent factor in feeble-mindedness.' Wylie's results on the memory of muscular movements, compared with those of Scripture from adult normals show 'the memory error of feeble-minded to be from two to ten times that of normals.' Lobsien concludes from his results that roughly the memory of normals is to the memory of imbeciles as five to three.[1]

Great differences and irregularities are undoubtedly a constant feature with this class of defectives. The fact to which Johnson attributes a general lowering of memory span is responsible also for a great variation, since great irregularity is one of the expressions of poor attention. The extent and nature of this factor is one of the chief things that we need to know more about, for it is evident from only a superficial observation that poor and irregular attention is one of the main lines of deficiency. But in order to do this, and also to determine more closely to what extent they are really defective in memory, it is necessary, I think, to observe a more rigid control of the tests and refinements of method. It is to a few conditions that should be considered, which one learns best after having had some experience with the cases, that I wish to call attention. I have already noted that in comparison of results of different cases with each other and with those of normals in any particular test it is quite necessary that the ages and general development of the cases should be nearly alike. The judgment of general ability can be made with much greater ease and accuracy in observing the cases themselves than such differences can be described, and the demand really involves no great difficulty. But of equal importance with this is the consideration of the amount of institutional training each case has had, and his degree of familiarity with the special stimulus used

[1] See his article in Kinderfehler, p. 202. For results of other experiments on the memory span of normal children, with methods very similar to that of Lobsien, see Netschajeff: Experimentelle Untersuchungen uber das Gedächtniss-Entwickelung bei Schulkinder. Zeitschr. f. Psych. u. Phys. d. Sin. Bd. XXIV, 1900. Also, Ueber Memorieren. Eine Skizzie aus dem Gebiete der experimentellen Pädagogischen Psychologie, by the same author, in Sammlung von Abhandlungen an dem Gebiete der experimentellen pädagogischen Psychologie. Bd. V, 1902.

in the test. Home life and institutional life are too frequently two quite different matters with sickly and defective children. Entrance into the institution often results in a great improvement in general health, when all their special needs are looked after by competent hands. Long and persistent special training adapted to the nature of their deficiencies brings about a second great difference between those outside and those in the institution. When these facts are considered in connection with the effect they may have had upon the familiarity of each case with the special stimulus used in the test, their importance becomes at once evident. Discrimination, and recognition of forms, letters, words, and numerals is with many cases the result of a long process of learning, quite different from that of any normal child, and quite different from each other. What the defective case does in a test depends in the first place upon how well he can handle the stimulus. The figures from Lobsien's tables, given above, strongly suggest this fact. From them it is seen that the difference in memory span for the two classes of children is much less when the stimuli are actual objects seen, and actual noises heard—a, and b—than is the case when the stimuli are only words called suggesting the different imagery—c, d, e, f, and g, h being an exception. The first explanation for this that suggests itself is that the normal children have developed a better word memory through several years of school training which the defectives have not had. In any case, it has long been known that memory is memory for particular things, and that it may be widely different for different things, according to the experience and interests of the individual. Again, if we wish to determine how far the memory span result is due to deficient memory, and how far it is due to poor attention, the first prerequisite is the observance of special means of insuring uniform perception of the stimulus. If several things are merely placed before the child and he is left to himself to see them, it will mean that in some trials he will not notice any at all, while in others his attention may be quite normal. The averages may then be a measure of irregular attention rather than poor memory. The same factor will be present when the child is required to recall or recognize what stimuli have been given. Unfortunately there seems to be no means of eliminating the effect of poor and irregular attention at the latter point. Lastly, if any interval is used between the presentation and recall of the stimulus, it is absolutely necessary that some efficient means of distraction should be employed during the interval. For reducing the effort to keep the stimulus in mind to zero is the only method of keeping that effort uniform for the different cases and for each case in successive trials. Unless this is done the stimulus may, furthermore, be remembered by some symbol, name or other image associated

with it, rather than directly, and the liability and accuracy of memory will then depend not upon the stimulus itself, but upon its associations.

With the observance of these general conditions the details of the procedure in the particular memory test must be dependent upon the particular problem that we wish to study. In the memory span work the problem, as usually stated, is to determine the limit of the ability in recollecting a number of stimuli immediately after a single presentation. The first choice between methods at this point lies between that of the recall and the recognition methods. In the one case the subject reproduces the stimulus, either itself or by symbols. In the other the stimulus is repeated for him together with some others, and the subject has only to discriminate between those presented, and those not presented before. The first, recall method, is the more active process, requiring attention to one's imagery, while, in the second, the recognitive processes are more passive, following immediately the re-presentation of the stimulus. If the feeble-minded are especially defective in attention it is evident that figures in the results of the two methods are not to be compared directly with reference to memory ability.[1] In the majority of cases of these children, however, choice is determined by the nature of the case, and the kind of stimulus that can be employed at all. If speech is very defective, as it often is, a large number of possibilities in method are eliminated. With such cases one is practically limited to the recognition method, unless they can write well and one resorts to the procedure of having them write down the names of the stimuli in recall. If the child has not yet learned the names of the stimuli to be used, *e. g.*, numerals, letters, diagrams, colors, etc., the recall method is also out of the question, for he will have no means of expressing, as in case of defective speech, what he remembers. Thus, in general, the recognition method is applicable with low grade cases where the recall method is not. But it has two decided disadvantages. For, in the first place, the number of things from which the child is to choose those that have been presented before must be kept small; if it is large he will weary of considering them all, and will choose at random. On the other hand, the smaller it is, the larger will be the element of correct guesses.

The memory span work, however, does not decide a number of things that are of fundamental interest in the study of questions that would come under memory studies. Here at once it

[1] The difference between these two methods was frequently verified in my own tests in which a series of ten pictures was used, employing the recognition method. When the child was asked to name the pictures, during the interval, that had been shown him he could usually recall only one or two. But when it came to picking them out from the ten he had no difficulty.

falls into two main lines of problems, viz., 'What is their so-called physiological retentiveness, the inherent persistency of the primary image? And secondly, what is the nature of their memory of a group of associated processes? When we are concerned with the former all possibility of associations with the stimuli must be ruled out. In either case we may concern ourselves with their memory span, or with their memory as dependent upon duration since the stimulus. It is not at all a priori certain that two children with the same memory span will also have the same memory curve as based upon duration. Of associations with the stimuli that are apt to occur the most important is the association between the stimulus and its name. Hence, except in the case in which the effect of their presence is the object of study, an arbitrary stimulus should be used for which no possible name can be invented, and which is also not apt to be remembered by any other symbol. Unless this is avoided our purpose is defeated, for the child may remember the stimulus during the interval by repeating its name to himself, or by some other symbolic representation that would be easier to keep in mind than the stimlus itself, as already noted.

My experiments on the memory of the nine cases described above can make no pretention at having been performed under the favorable conditions and methods outlined. The main result of the memory tests has rather been to raise questions and to suggest refinements of method. Two sets of memory tests were made. One in which the child was asked to name as many as he could of a group of ten pictures[1] that were being used at the same time in the second set of memory tests, a memory span test by the recognition method. After three weeks of memory span work with these ten pictures each child was asked to name as many of the pictures as he could each day before seeing any of them. This was continued for seven days. Then after an interval of five weeks during which they saw none of the pictures in any test, the same was repeated for two days without the pictures being shown. Each time persistent coaxing was employed so as to eliminate as far as possible the effect of mere unwillingness to try to recall them. The following table gives the results in percentages. Only the results of the last two days before the five weeks interval is used in the first column.

In the memory span test the same ten pictures were always used. Each day two, three, four, and five pictures at a time were shown each case, which, after an interval, he tried to pick out from the ten. The whole was repeated sixteen times

[1] Pictures of a goose, chick, pig, cat, horse, shoe, bag, necktie, umbrella, and scissors were used, taken from Reed's card-board object pictures, as advertised in Milton Bradley Co.'s catalogue on Kindergarten Material and School Aids. Springfield, Mass., 1903.

TABLE I.

CASES	A	B	C[1]	D	E	F	G	H	I
Before 5 week's interval	85	75		80	80	70	95	85	80
After " " "	75	75		70	65	65	65	45	75
Loss	10			10	15	5	30	40	5

for each case. In showing the pictures the child was made to name those shown twice over as I pointed to them, so as to secure uniformity of perception. Four intervals were used between presenting the pictures and picking them out from the ten, viz., ten, twenty, forty, and eighty seconds. But the fact that nearly all of the cases remembered at times during the interval by repeating the names of the pictures to themselves quite defeated the purpose of determining the relation between their memory span and the interval between stimulus and recollection. The percentages of correct choices made when two, three, four, and five pictures were shown are given in the following table. The figures given, however, are those after correction has been made for the number that could have been chosen correctly by mere guessing, due to the fact that the pictures were always chosen from the limited number of ten. Thus for the per cent. of correct choices made when five pictures were shown 50% is deducted, for four pictures shown 40% is deducted, etc., from the number of correct choices.[2]

TABLE II.

CASES	A	B	C	D	E	F	G	H	I	AV.
Two pictures shown	80	80	64	80	80	80	80	80	80	78
Three " "	43	57	26	68	66	60	70	70	65	58
Four " "	29	41	27	49	52	38	51	41	10	38
Five " "	20	36	19	44	44	35	31	32	30	32
Average	43	54	34	60	61	53	58	56	46	

It will be noted from the figures that the memory span for these cases, with pictures, lies between two and three. C alone made any mistakes when as few as two were shown, while G and H alone made no mistakes when as many as three were shown. The averages in the lower column have no significance except as a means of comparison of the cases with one another. A comparison with the preceding table will show no direct relation between memory permanency and memory span. The two tables show the order of proficiency in memory permanency during a long interval, and memory span to be the following:

[1] C's speech was entirely unintelligible, and hence no results could be obtained from him in this test.

[2] It will be remembered, however, that this introduces another error at or near the limit of absolute certainty in the memory span. Thus, most of the cases made no mistakes at all when only two pictures were shown, but after deducting for chance error they have only 80% of correct choices.

B — (I—F)—(A—D)—E—G—H, and
E—D—G—H—B—F—I—A, respectively.

Peculiarly, this gives an inverse relation; the four best in memory span are the four poorest in memory permanency. If, from the first table, we compare the order of proficiency in remembering a large number of pictures in the first place with the order according to memory permanency we have:

G—(H—A)—(D—E—I)—B—F, and
B—(I—F)—(A—D)—E—G—H, respectively.

Here G, H, and A, the best in remembering a large percentage of the pictures before the five weeks' interval, are among the poorest in memory permanency. This would correlate high memory span and high proficiency to commit to memory, with a low degree of memory permanency. When we remember from the psychology of memory in normal persons that that portion which is committed to memory under a high pressure of effort and attention is least permanent, then these relations become more intelligible. We may have here an analogous instance. The poorest cases show the greatest memory permanency because they have in the first place remembered only so much as could be done without effort.

Comparing the results for the different intervals, ten, twenty, forty, and eighty seconds, between showing the pictures and their picking them out from among the ten, shows practically no effect of the interval upon the memory span. The averages are exactly the same for all the intervals, excepting the eighty seconds, for which it drops 3%. This was undoubtedly due to the factor already noted, viz., that some of the cases remembered the pictures during the interval by repeating their names to themselves.

Incidentally the test has brought out the fact that there were some instances of decided memory preferences, in the case of the ten pictures used. They would remember some pictures better than others, and forget some more frequently than others. In Table III the percentage of the number of times each picture was not chosen when it had been shown, and the percentage of the number of times it was chosen wrongly, when it had not been shown, are given.[1] In the first horizontal column for each case are given the percentages forgotten, in the second, the percentages chosen wrongly for each picture.

A study of these figures will show that in the large majority of instances those pictures that have been forgotten most are among those that have been chosen wrongly least. The most probable interpretation of these facts is that a certain picture is chosen wrongly more frequently than another because it pos-

[1] The picture of the bag was not shown at all. A chose it wrongly twice, E once and I twice; the others never.

TABLE III.

	Goose.	Chick.	Pig.	Cat.	Horse.	Shoe.	Necktie.	Umbrella.	Scissors.	M. V,
A	18	28	13		22	25	47	13	44	10
	3	3	2	6	3	1	4	5	3	1
B	13	19	6		6	19	19	6	25	7
	3	3	1	1	1	2		2	1	.77
C	13	38	6	19	22	50	47	18	50	14
	8	3	4	6	3	2	3	4	1	2
D	25			6	3	6	3	6	19	7
		2		1			2		1	.66
E	13	13	6		6	3			6	4
							1	2	1	.57
F	25	16	6		3	31		18	13	9
	1	2		2	1		2	4	3	1
G	6	13	6		6	13	19		13	5
	2			1			2	2	1	.79
H		6	19		16	28	3		19	9
	1	2		4			1	2	1	.89
I	50	22	41		19	34	28	13	25	11
	3	3		6	5		2	2	4	1.6

sesses the greater interest. When the child has quite forgotten which the right one is, it is pretty certain that he will choose either the one that is nearest or that his eye happens to rest on, or he will pick according to his likes. Why he should forget one picture oftener than another is more evident. Interest determines the persistency of his imagery. If he likes a certain picture better than the others, or has more associations connected with it, its image will be easier to hold, while at the same time he is incapable of the effort of attention to keep the others in mind. Consequently, he forgets some always, and remembers others. The figures for the picture of the cat show very clearly what the effect of interest has been. Although one would expect that the interests of the different cases would be in different pictures, and this Table III shows, yet the averages show that the pictures themselves have a considerable independent memory value. The following table gives the averages for the nine cases, from the percentages in Table III.

TABLE IV.

Goose.	Chick.	Pig.	Cat.	Horse.	Shoe.	Necktie.	Umbrella.	Scissors.
18.1	17.2	11.3	2.5	11.3	23.2	18.4	8.2	23.6
2.3	2	.7	3	1.4	.6	1.9	2.6	1.8

Here it will be seen that the pictures of the shoe and scissors lead in being oftenest forgotten, while the former leads also in being chosen wrongly least of all, and the latter stands fourth in this respect. Pictures of the cat and umbrella were by far the best remembered, and they are also the two that are chosen wrongly most frequently.

The fact that these results show memory preferences is in itself of no significance. It is only the degree of it, under the particular conditions of the experiment, that is of value. It has long been known that memory with normal persons differs for different things.[1] Unfortunately, on account of the different conditions of my test, my results cannot be compared directly with any others. But that memory preference is a characteristic especially of mental deficiency is seen at once upon comparison of the results in Table III for the different grades of cases. The poorest cases, A, B, C, and I, present the most striking instances of memory preference. The last column of figures on the right, mean variations of the figures in the table, give a measure of the degree of memory preferences for each case. The average of these mean variations for A, B, C, and I is 10.5, and 1.34 for percentage forgotten and percentage chosen wrongly, respectively. For the better cases, D, E, F, G, and H, these averages are only 6.8 and .78, respectively.

B. Practice.

1. *Throwing at a Target.*

In a general way we know, of course, that the feeble-minded are deficient in the ability to gain in practice in any kind of work. The designation 'arrested development' is only another way of expressing the fact that there has been an inability to learn. And to gain in practice is nothing more or less than learning. We know, too, that the details of the nature of the practice curve with perfectly normal persons are subject to very great variations; that these variations are dependent upon the nature of the work, and upon the individual, besides many other minor factors.[2] These things considered, it was the purpose of the following practice tests to furnish some standardized means of studying the factors that enter into the practice curve of this class of defectives, and to compare them with those that we know to be present in determining the practice curve of normals. Granted that the two are different, and that practice gain, especially, is slower with the former than with normal children, a practice test under simple and controlled conditions

[1] From an experiment von Tschisch concludes that memory is different for the different sense departments. See Dritter internationaler Congress für Psychologie in München, 1896, p.95. The figures computed from Lobsien's tables, given above, show how memory differs for different *classes* of stimuli for both normals and defectives. His tables and curves on results from normals alone show this even much better. For an excellent discussion of this and related points, see Stratton: Experimental Psychology and its Bearing upon Culture. New York, 1903.

[2] See especially articles in Kraepelin's Psychologische Arbeiten. Vols. I-IV.

ought to reveal an essential difference in the factors that enter in the two instances. In the present work two motor tests were chosen as best fulfilling the requirements for such a test. One consisted in throwing with an uncovered tennis ball at a large target, the other in tapping on a re-action key in unison with the beats of a metronome. In the throwing test a target forty inches in diameter was used. It consisted of alternating black and gray rings, four inches wide, with an orange colored central spot five inches in diameter bordered by a black ring one and a half inch in width. This orange and black centre gave a good contrast and thus helped to fixate the attention upon the centre of the target, and to avoid throwing at the target in general instead of at the centre. The whole target was marked off into octants. In recording the results both the octant and the ring hit were recorded. The black and orange centre counted five, the next ring four, etc., to the outside ring counting one, and outside of all rings, zero. The target was hung so that the centre was about a foot below the level of their shoulders. To make hitting the centre about equally difficult for all, they were divided into two groups, A, C, and G throwing at a distance of twelve feet, and the others at fifteen feet. Each case threw twenty times a day, for four consecutive days of the week, and continued for seven weeks. Two cases were taken at a time. Every means of exciting their interest and rivalry in hitting the centre was constantly employed. To avoid their becoming weary of their task each day, the two that were taken at a time alternated by five throws at a time. But this seemed to be unnecessary precaution, and, after the second week, they alternated with ten throws at a time. On account of the odd number of cases C generally,—a few times A, and B—threw alone, and after the second week threw the twenty times each day without pause.

In this test there are a number of ways in which practice effect might have been expected. In the first place, the number of points gained per day should increase. Secondly, where there is a constant error, *i. e.*, constant hitting in the same quadrant of the target, this should decrease. Thirdly, the regularity of the throw for each day should increase. Fourth, if there is each day an effect of weariness, so that the last throws on each day are poorer than the first, or if there is an arousal to the task, so that the last throws are the better, practice should effect these factors. Fifth, the daily variations should decrease, *i. e.*, practice should make the results more independent of the changes in daily disposition. The results are insufficient to give any definite evidence on all these matters, and probably because the last three factors—weariness, arousal, and daily disposition are too variable and complex to make a clear

interpretation of the results possible. I shall give the results on these matters in the order indicated.

The practice curves based upon the weekly averages of the number of points gained per day are very irregular, as is seen in Table V. Yet, after the first three weeks it was clear that the curve would not be like that usually obtained with normal subjects. It does not rise rapidly in the beginning, but hardly at all, and soon begins to drop actually below the point at which it started.

TABLE V.[1]

Weeks.	1	2	3	4	5	6	7	Av.
A	37	40.5	38	36.25	36.5	33.75	34.25	36.61
B	41.25	28.5	38.75	36	43.5	36.75	39	37.68
C	38	49	38	36	41.5	—[2]	43	36.61
D	33.25	24.75	30	26.5	29.25	31.75	34.75	39.97
E	44.75	44.5	28.5	39	42.75	43.25	41.75	40.79
F	31	33.75	27.75	22.75	32.25	34.5	31.5	30.5
G	49.25	56.25	55.75	50.25	57.25	59.25	60.5	55.5
H	45	41.75	43	44.5	44.5	40	46.25	43.59
I	32.75	37.5	25.25	24.75	31	21.75	18.75	27.36
Av.	38.36	39.67	36.06	35.11	39.83	37.63	38.86	

The cause for this decline in the curve is not far to seek. Only one interpretation is possible, and many other general observations also bear it out. The novelty of their task soon wears off, they become gradually more tired of it, and hence throw with less interest and attention. The conditions affecting their interest did not remain the same throughout the seven weeks. It is a generally recognized fact that feeble-minded children do better in their general class work when a stranger is present to watch them. This was the case in the present test during the fifth and sixth weeks.[3] On the last day of the fifth week a maximum systematic coaxing was tried, attempting especially to arouse their rivalry, in order to see what effect this would have on the curve. During the sixth week no extra coaxing was employed. The grouping of the results with respect to these factors that affected their general interest and attention is instructive.

TABLE VI.

	A	B	C	D	E	F	G	H	I	AV.
Av. 1st and 2nd Wks.	38.75	34.88	43.33	29	44.63	32.38	52.75	43.38	35.13	39.36
Av. 3rd and 4th "	37.13	36.75	37	28.25	33.75	25.25	53	43.75	25.	35.54
1st 3 days of 5th "	34	43.3	43	26.33	39.33	32.66	60	43	24.66	38.81
Last day " " "	44	44	37	29	53	31	49	49	50	42.89
Av. of 6th "	33.75	36.75	——	31.75	43.25	34.50	59.25	40	21.75	37.63
Av. of 7th "	34.25	39	43	34.75	41.75	31.5	60.5	46.25	18.75	38.86

[1] It will be remembered that A, C, and G threw at a distance of twelve feet, and the others at a distance of fifteen.

[2] Omitted on account of sickness.

[3] Dr. J. W. Slaughter, Docent in Clark University, kindly helped me with the tests and in taking down observations during two weeks.

The main things to be noted in the figures of these two tables are perhaps, first, great irregularity in the curve for each case. In table V the figures are weekly averages, based upon the number of points made in twenty throws a day for four days. Yet the weekly variation reaches 50% in one instance. Many of the daily variations are much higher. Secondly, the matter of interest and effort really to hit the centre has been the main factor in determining the course of the curve. It is only in the general average for the nine cases that any genuine practice effect is noticeable, and here it is slight. The average for the second week stands only a little above that of the first, and after that it clearly drops until the fifth week. Decrease in interest and attention make the curve go down. Thirdly, the extent of the influence of these is seen in the general averages in Table VI. Where a special attempt was made to raise them to a maximum, in the last day of the fifth week, the average is 42.89, considerably above any other average. During the sixth week the average falls again below that of the fifth. What the high average in the seventh week is due to is not entirely clear. In D it was quite noticeable that the sense of rivalry that had been quite well aroused during the preceding weeks continued in the seventh. On the other hand, H, who kept up a high average in the seventh week, did not seem to show any such permanent change in attitude towards his task. However, considering the results on the whole, it is more probable that the high averages of the sixth and seventh weeks are due to the more or less permanent change in attitude caused by the previously aroused rivalry, a change that might readily escape notice in general observation, than that they are directly due to a real practice gain.

Although the actual number of points made per day decreases, thus showing that the effect of practice is less than that of other factors, practice effect is seen in other ways. In throwing at the target most of the cases showed a considerable constant error; they constantly hit in one half of the target more than in the other. This fact has other interests besides that of the influence of practice upon it. But we must note in the first place that with practice the amount of this constant error decreases with most of the cases. Table VII gives the constant errors in percentages for the first three weeks and the last three, for each case.

Thus, for the first three weeks 60% of A's hits were in the upper half of the target, during the last three weeks 64% were in the upper half. The figures in the first two columns show in the first place one way in which decrease in interest resulted in decrease in the number of points made per day. Here it is seen that six of the nine cases, B, C, D, G, H, and I, threw low

TABLE VII.

		Upper half.	Lower half.	Change.	Right half.	Left half.	Change.
A	1st 3 Wks.	10			9		
	Last " "	14		+4	7		−2
B	1st " "	7			13		
	Last " "		1	−8	3		−10
C	1st " "		13			7	
	Last " "		17	+4		23	+16
D	1st " "		3			9	
	Last " "		17	+14		6	−3
E	1st " "		17		2		
	Last " "		3	−14	0		−2
F	1st " "	5			8		
	Last " "	12		+7	2		−6
G	1st " "	4				4	
	Last " "		5	−9		0	−4
H	1st " "	13			3		
	Last " "		3	−16	12		+9
I	1st " "		16		24		
	Last " "		29	+13	11		−13

more frequently during the last three weeks than during the first three. With lack in interest has been correlated a lack of effort to throw hard enough. The other three have increased the speed of their throw, two of them, A, and F, increasing their constant error, and the other, E, decreasing it. On this account these figures comparing the number of hits in the upper half with the number in the lower half lose their significance as regards the effect of practice upon the constant error. But the others show that seven of the nine cases have decreased their constant error in the right or left half of the target, while C and H have increased it. The reason why there should be such a constant error in the first place is undoubtedly that a characteristic swing of the arm and manner of grasping and releasing the ball in throwing has already become fixed, and this is, to the extent of the error, out of adjustment with the perception of the spot that is aimed at. At the same time it is safe to say that the correction of the error has not been a conscious correction. It is not to be supposed that any of these children noticed that they threw 10 to 15%, for instance, more frequently in one half of the target than in the other, and consequently made allowance for such an error. The adjustment, then, has been an unconscious one, and involved the breaking up of a more or less established motor habit.

A second way in which the results show a real practice effect

is in an increase in the regularity of the throw. The hits tend to accumulate on the intermediate rings of the target, thus approaching a sort of an average throw. In table VIII the results of the first three weeks and of the last three are again compared with reference to this point.

TABLE VIII.

	A		B		C		D		E		F		G		H		I		AV.	AV.
0	62	70	72	66	63	51	99	87	60	56	93	94	22	13	48	52	83	120	66.89	67.67
1	39	41	39	30	47	31	32	40	39	32	37	23	32	23	42	36	45	35	39.11	32.33
2	36	54	47	47	31	45	47	42	45	47	37	43	48	35	42	51	39	35	41.33	44.33
3	37	41	34	49	50	49	32	36	36	52	39	45	65	81	55	40	37	24	42.77	45.22
4	32	24	31	34	25	30	20	24	31	36	22	26	43	68	32	40	27	15	29.22	33
5	15	10	17	14	23	14	10	11	19	17	12	9	30	20	20	21	8	11	17.11	13.11

The first vertical column for each case gives the number of hits for the different rings of the target during the first three weeks, the second vertical column gives the number during the last three weeks. The figures 0 to 5 in the first column designate the rings of the target, 0 standing for outside all rings, and 5 for the centre. In considering the averages in this table it will be noted that the 0-column for the last three weeks is high on account of the very exceptional record of I. From the preceding table it will be remembered that I increased the number of hits in the lower half of the target 13% during the last three weeks. The records of his individual throws also show that during this time he threw below the target, outside all rings, much more than at first. Consequently the average of 67.67 in Table VIII is too high, it being raised not by an increase in irregularity of I's throw, but by his becoming weary of the work and too lazy to throw hard enough. This exception aside, it is seen that during the last three weeks the hits accumulate on rings 2, 3, and 4 at the expense of the others. In Table V the average of the average for all cases for the first three weeks is .74 lower than the same average for the last three weeks. Thus the first and last three weeks is practically the same. The increase in regularity of the throw is, then, independent of any factor that increased or decreased the number of points made. This is true not only of the general averages, but also of the exceptional cases whose throw became gradually poorer, although more regular. This is seen best in the results of A, and E, in Tables V and VIII. Taking these facts together, it is clear that in this increase in regularity we have to do with a genuine practice effect. As to just what in the total process the practice is to be attributed, there may be some question.

So far only two factors, viz., interest and attention, and practice, have been noted that entered in determining the number of points made in throwing. There remains a third, daily disposition, a very important one, as will be seen. In Table IX

are given the daily mean variations in the number of points made per day, for each week. Here the 6.67, *e. g.*, for A is A's daily mean variation during his first week. It is seen that the general averages for all cases in the lowest column change from week to week. They show an interesting relation when

TABLE IX.

Weeks.	1	2	3	4	5[1]	6	7
A	6.67	9.25	.5	5.13	1	2.75	8.25
B	5.75	9	7	2.5	7.57	3.75	2
C	4.22	2	7	2	4.67	——	2.5
D	5.63	8.63	11	3.25	1.78	4.75	5.75
E	2.38	6	4.75	3.5	6.44	2.75	5.25
F	6	4.25	3.38	4.25	3.11	9.25	4.25
G	4.75	4.75	5.25	4.25	6	4.38	3.5
H	2.5	5.75	3	3.5	8	3.5	7.88
I	4.25	3.5	6.25	4.13	5.55	3.75	3.88
Av.	4.88	5.90	4.24	3.60	4.90	4.36	4.81

compared with the general averages in Table V, giving the average number of points made from week to week. This shows that the daily mean variation runs parallel, week for week, with the number of points made each week. It is greatest on the weeks in which the number of points made is greatest, and smallest where the latter is smallest. Now, since the daily variations are due to changes in the daily disposition, incidental factors aside, this means that the high averages in points made are due to great spurts on days when they felt inclined to do so, when their general disposition was good. This fact taken in connection with the results previously stated makes it possible to account for the changes in the daily mean variations from week to week, and also the interpolations of all the main factors that entered in determining the curve. It was seen before that the averages in the number of points made fell during the third and fourth week, and rose again in the fifth; and that this was due first to a decline in their interest in the task, and second, to an increase in that interest when, during the fifth week, it was artificially aroused. It is seen now that high records were due to a favorable daily disposition. The effect of these two factors, high interest and favorable disposition, upon the curve should, a priori, be the same. Each should raise the average. Their character, psychologically, is alike, in so far that high interest in a particular task means favorable disposition towards that task, and *vice versa*. But interest is dependent upon the particular task, may be limited to it, is, in

[1] The mean variations for the fifth week are based on the first three days of the week only, since on the fourth day of that week the throwing was better on account of the special and systematic coaxing introduced then.

the present case, highest in the beginning and soon wears off. Daily disposition, on the other hand, is independent of the particular kind of work, varies independently of it, and is probably connected with changes in health, general metabolism, and the like. Now what the figures in Tables IX and V suggest is that favorable disposition did not necessarily imply high interest in the particular task, but that the former was necessary for the latter. For, during the first two weeks high variations and high averages in the number of points made go together. When that interest drops during the third and fourth week, lowering the averages, the mean variation drops also, showing that the changes in daily disposition did not alone effect the curve materially in the absence of the other factor. With the artificially aroused interest in the fifth week the averages rise, but the mean variations rise also, showing that the possibility of arousing their interest was dependent in the first place upon their favorable disposition.

Two other facts, one obtained from general observation, and the other seen in Table V, enforce this interpretation. It was frequently illustrated that a particularly lively mood on a certain day did not necessarily mean an increased interest in hitting the centre of the target. The unusual energy was spent, naturally enough, in other ways, in bouncing and chasing the ball about the room, *e. g.*, rather than in an activity which they had come to dislike more or less. Secondly, it will be remembered that case A was described as one of 'chronic weariness.' In other words, he had a permanent unfavorable disposition. In accordance with this, Table V shows that he is the only case whose weekly averages were unaffected by our effort to arouse his interest in the fifth week.

2. *Tapping on a Re-action Key.*

The tests in tapping were intended for a study of their attention and other things, besides that of practice. I shall consider at present only those results that are concerned the more immediately with practice. The apparatus consisted of the reaction key, some dry batteries, a kymograph, a pendulum at first, and later a metronome, for a time-marker, and two DePrez signals. The record on the kymograph drum, then, consisted of the tracings of the individual taps made by the child on the re-action key, together with that of the time-marker, which was set to half second beats. Four groups of tests were made. In all the child was seated at the table with his right arm and hand, with which he tapped, resting comfortably on the table, and facing away from the apparatus. In the first group the tapping was at his natural rate, the child being told simply to tap, all suggestion of any particular rate

being avoided, but he was always promptly urged to go on whenever he stopped altogether. To avoid any sounds of the apparatus suggesting any rate, a pendulum was used for a time-marker instead of the metronome, used later. In these tests each case tapped for a minute a day for four days. A record was taken of every such minute series. In the second group all the conditions remained the same, except that the child was told to tap just as fast as he could, and every possible means of encouraging a maximum rate was constantly employed. This was continued for three days only. The third and fourth groups were intended for practice tests primarily. They consisted of regulated tapping, the metronome being the regulator, and at the same time the time-marker, instead of the pendulum. The child was told to tap in unison with the beats of the metronome. All the apparatus except the button of the reaction key and the metronome was screened from the child, so that he could not see and watch it by turning around. In the third group the metronome was set to half second beats, this being a rate a little slower than the natural rate of tapping of most of them. Five one-minute series were taken each day, with a few minutes between series, and continued for six days. A break of three days followed the fourth, but this did not affect the results noticeably. Records were taken of only the second and fourth one-minute series of each day. One of the unrecorded minute series each day was taken passively, that is, the child's hand was taken and made to tap in exact unison with the metronome. In the fourth group the only change was that the metronome beat at second intervals instead of half second, and the test was continued for only two days. In the regulated tapping it was intended to study the nature and amount of improvement, and the factors that would enter to prevent improvement, as in the previous tests in throwing at the target. In counting the records the number of taps were grouped into five seconds intervals, these being small enough for the practical purpose of determining the amount of improvement. If, then, the child got in the ten taps for each five-second interval, during the third group of tapping tests, the record was regarded as containing no mistakes. Thus in dividing the counts into five-second intervals, there were in each minute series twelve chances to get in the right number of taps. The results of the regulated tapping are given in Table X.

In the first two horizontal columns the average number of taps per five seconds in their natural rate, and the mean variation from that rate, respectively, are given for each case for the sake of comparison with the other figures. In the first vertical column for each case are given the percentages of the number

TABLE X.

		A		B		C		D	
Average in natural rate,		17.82		12.90		19.94		12.79	
M. V. " "		3.28		2.66		2.19		1.12	
Tap per half sec.	First half,	41.6	1.54	50	1.73	53.33	1.07	68.3	1.05
	Sec'nd "	25	1.6	16.66	4.2	63.33	2.83	73.3	1.5
Tap per second.	First half,	41.6	2.86	29.1	3.18	79.1	1.4	79.1	1.4
	Sec'nd "	16.6	2	16.6	2.65	45.8	1.23	83.3	1
Average,		31.2	2	28.09	2.94	60.39	1.63	76	1.35

E		F		G		H		I			
20.19		11.88		17.5		10.78		16.94			
2.96		1.32		1.87		.85		.78		Av.	Av.
16.66	3.58	66.66	2.8	66.66	1.25	85	1.22	41.66	1.6	54.36	1.76
5	3.54	65	1.9	76.66	1.21	80	1.33	70	1.77	52.77	2.21
20.8	2.89	70.8	1.86	——	——	83.3	1.75	79.1	1.80	60.36	2.14
8.33	2.68	70 8	1.71	——[1]	——	91.7	1.5	70.8	1.29	50.49	1.75
10.2	3.17	68.32	2.07	71.66	1.23	85	1.45	65.39	1.62		

of times the correct number of taps were made in the different five-second intervals in the regulated tapping. Thus the number of times A got in the right number of taps, *i. e.*, ten during the first five[2] one-minute series when the metronome beat half second intervals, was 41.6% of the total number of chances he had to get it correct. The second vertical column for each case gives the mean variations in the number of taps from the correct number. The averages below are averages of the figures in the table, and serve only as means of comparing the cases. The results are very irregular, as is seen, and give little information as regards practice. The averages on the right, however, show that their tapping became poorer during the second five one-minute series; that it was best in the beginning of the next group of tests, in which the rate was changed from half second to second taps, and that it dropped to the poorest immediately after that. There is no question but that this is due to the same factor, viz., losing of interest, which mainly determined the curve in the throwing records. With the slight variation in the procedure came a new interest, but this disappeared at once. The main interest in the table, however, attaches to its analysis, which in connection with the general observations made during the test shows what factors entered in determining for each case the percentage of the number of times the right number of taps were made in the five seconds. In watching them during the tapping several factors were found to be prominent in determining the nature of their tapping. The large variations were almost entirely due to their getting

[1] Omitted on account of sickness.

[2] The test was continued for six days, as was stated, but on account of unavoidable omissions on the sixth day for some of them, the results for all cases are those of only the first five days.

tired of it and stopping altogether, by being distracted by something and stopping, or by willfully tapping much too fast. Thus A's mean variation was raised almost entirely through his stopping because he was tired of it and did not like to continue. The same was less true of B, but he also stopped frequently through distractions, and as often willfully tapped too fast. E's variations were high on account of his frequent alternately tapping very fast and then suddenly stopping again, showing apparently an absolute inability to get his attention on the proper rate. F's variations were raised mainly by stopping through distractions, this being a general characteristic of the case. C and I, especially I, seemed to tap mechanically with a quite regular rate independently of where their attention was. In fact I had a strong tendency to tap at his natural rate, and had difficulty in changing it to a slower rate. D, G, and H were the only cases that seemed to keep their attention regularly on the tapping, making few stops, and never purposely tapping too fast. All these factors in the other cases entered, of course, in decreasing the number of times the correct number of taps would be made in the five-second intervals. But it will be remembered that in the regulated tapping the rate was slower than the natural rate for any of the cases, as is seen in the table. To overcome this natural rate was thus a part of the difficulty for all of them in the regulated tapping. The next table will show what relation this tendency to keep to the natural rate, together with the other factors, has borne to their tapping in the regulated series. Table XI is made up from Table X. It gives simply the order in which the cases stand in regard to four things. In the first horizontal column is given the order according to their proficiency in tapping in unison with the metronome. In the second is given their order according to their variations from the correct number of taps for the five-second intervals. In the third is giyen their order according to their natural rate, the one with the slowest natural rate standing first, etc. The last gives their order according to their variations in their natural rate.

TABLE XI.

	A	B	C	D	E	F	G	H	I
Per cent. correct,	7	8	6	2	9	4	3	1	5
Variations in regulated series,	6	8	5	2	9	7	1	3	4
Natural rate,	7	4	8	3	9	2	6	1	5
Variation in natural rate,	9	7	6	3	8	4	5	2	1

Here it is seen that the order in the first column keeps quite close to that in the others, throughout, for the nine cases. I is an exception in his variations in his natural rate on account of the purely mechanical nature of his tapping, which made

him very regular in the non-regulated series, but it was too fast, and in his attempt to adjust it to the proper rate his tendency to the natural rate is well expressed by the order in which he stands in the first and second columns. G has a high natural rate, but he stands first in general development and his greater ability of attention gives him the rank he has. F's natural rate is close to that of the first group of tests in the regulated tapping, but his great tendency to be distracted raised his variations, while at the same time he ranks fair in the first column because he tapped with good attention during the intervals between distractions. B's natural rate is favorable to the regulated rate, but his great variations, due to the factors mentioned, make him rank low. The other cases need no special comment, for it is seen that their natural rate and their tendency to vary contributed about equally to their proficiency in the regulated series. The general average in the mean variations in Table X does not decrease, and this is due to the fact that whatever practice effect there might be decreasing it, is over-balanced by their becoming tired of the work and thus becoming more irregular through stopping, etc.

The throwing and the tapping tests were the only two that were primarily intended for the purpose of studying the factors that would enter in determining the changes in their proficiency in the work as it was continued. Some of the other tests, however, also furnish evidence on the nature of these factors, but the statement of these results will be postponed until we come to the consideration of the other results of those tests.

C. Attention and Effort.

1. *Tapping on Re-action Key.*

That feeble-minded children are defective in attention and will has been the statement of every observer that has written upon the subject. Indeed, this defect has been regarded so fundamental that Sollier has made it the basis for the classification of all cases of arrested development, and he thus proceeds to classify them into three grades according to the degree of their defective attention. But this is a broad generalization, and too abstract to present any definite picture of concrete instances. Besides, general observation, upon which alone the analysis rests, can make only a very rough and inaccurate quantitative measurement.

The tests grouped under the present heading were aimed at two things mainly. First, to get some sort of measurement of the degree of effort they were capable of putting forth in a particular task. And second, to measure their attention span. Under the first, two sets of tests were made. One consisted in comparing their maximum rate of tapping with their natural

rate. The other determined their association and discrimination time in four different ways. The tapping test has already been described. In the maximum rate series every effort was made to make them increase and keep up their speed, by coaxing, by arousing their rivalry, etc. In the next table the average maximum rate and the average natural rate for each case is given.

TABLE XII.

	A	B	C	D	E	F	G	H	I	AV.
Av. natural rate,	17.82	12.90	19.94	12.79	20.19	11.88	17.5	10.78	16.94	15.64
" maximum rate,	18.72	12.85	21.75	17.89	21.95	14.81	16.31	12.83	18.37	12.28
Difference,	.90	-.05	1.81	5.10	1.76	2.93	-1.19	2.05	1.43	1.64

This gives the general averages of the number of taps per five seconds for each case. It is a rather surprising result. For it shows that they are practically incapable of any voluntary effort whatsoever. Perhaps some allowance must be made for the fact that the maximum series was given after the other, and they were probably already getting a little tired of the test. But that too would only show that they are unable to overcome by their own will their disinclination to do a certain thing. The average maximum rate of the average adult normal person is considerably above twice the average in this table, and their average natural rate is just about what an easy-going natural rate of a normal person would be. It is also seen that in a general way the difference between their natural and their maximum rates increases with the grade of general development. A, B, C, and I are the poorest cases, and they stand lowest in their differences. G is the only exception, his difference being negative, although he stands highest of the nine cases in general development.

In close connection with this incapacity for voluntary effort in raising their maximum rate above their natural stands the matter of their fatiguability, and the capacity to overcome the effects of fatigue by effort. Wylie, in a similar test in tapping, finds the difference in the number of taps during the first five seconds and the last five of a forty-five-second series to be small.[1] Hence they apparently show but little effect of fatigue. In a dynamometer strength test he finds their deficiency very great. But he remarks that 'taking the weight and height as an index of muscular development, we conclude that fully three-fourths of the deficiency in muscular power must be due to some central defect, as lack of nerve power, or will power.'[2] In the next table are given my results. In the first vertical column is given the general average of the number of taps of all of the first, second, and third five-second intervals, *i. e.*,

[1] Psycho-Asthenics, Vol. V, 2. [2] *Ibid.*

average number of taps per five seconds for the first quarter of the minute series, etc., for the other three vertical columns. The last vertical column on the right gives the difference between the rates for the first and fourth quarter minute. The averages at the foot are averages of the figures in the table. The first thing of interest in this table is the fact that their natural rate decreased after the first fifteen seconds. It is of course clear that there should be practically no fatigue in normal persons, tapping at this rate. The decrease in rate with these children is undoubtedly due to two factors. One is that their attention tires at once. That is, they cannot keep in mind the idea of keeping up their task. After the first several seconds their mind wanders to other things, and the rate

TABLE XIII.

		1st	2nd	3rd	4th	Dif.
A	Natural rate,	20.42	16.25	17.58	16.58	3.84
	Maximum "	21.78	18.22	15.11	19.11	2.67
B	Natural "	15.50	12.42	13.17	14.02	1.48
	Maximum "	15.33	13.78	13.11	10.50	4.83
C	Natural "	21.66	19.90	19.15	18.23	3.43
	Maximum "	24.67	21.67	21.00	19.67	5.00
D	Natural "	14.25	12.50	12.67	11.25	3.00
	Maximum "	19.44	16.78	18.11	17.22	2.22
E	Natural "	21.83	19.50	19.75	19.67	2.16
	Maximum "	27.67	20.22	20.00	19.89	7.78
F	Natural "	13.00	11.58	11.00	11.94	1.06
	Maximum "	16.57	15.00	14.89	13.11	3.46
G	Natural "	20.17	17.50	17.67	14.67	6.50
	Maximum "	18.56	16.56	14.56	15.56	3.00
H	Natural "	11.83	11.08	10.33	9.83	2.00
	Maximum "	14.78	12.11	12.33	12.11	2.67
I	Natural "	17.75	17.17	16.50	16.36	1.39
	Maximum "	20.78	18.44	17.67	16.67	4.11
Av.	Natural "	17.38	15.32	15.31	14.84	2.54
"	Maximum "	19.95	16.98	16.30	15.98	3.97
Difference,		2.57	1.66	.99	1.14	

consequently drops to that extent. And secondly, they are not able to resist the effect of the very slight degree of muscular fatigue that does enter. To do so would require an increase in effort, and of this they are incapable. That the first factor is present is of course borne out by many general observations. That as a class they cannot attend to anything very long is the statement of every observer, and is the basis of the more general view that a defective attention is their fundamental deficiency. Table XIV will give some idea as to how their attention does last, and how much it drops in this test. That the second factor mentioned was present, that is,

that they were incapable of resisting even a very slight degree of muscular fatigue, the general analysis of the results in Table XIV shows quite well. The maximum rate is, on the whole, only slightly above their natural rate. But the difference between the two rates is greatest at the beginning of the minute series. In the averages for all cases it is seen that it is more than twice as great for the first quarter minute as for any of the other three quarters. By the third quarter the two are practically the same. Now the difference in actual fatigue in the two rates cannot have been great. The rates are only slightly different, and both are slow enough not to permit of much fatigue. Yet to the only very slight difference there could have been they have promptly reacted, by slowing up in their maximum rate faster than in their natural rate. These facts taken together can mean only one thing, viz., that they are almost absolutely incapable of any voluntary effort whatsoever. From this it follows, as the results also show, that there is no such thing with them as genuine, normal fatigue. They can never be made to work hard enough in the first place to make much fatigue possible, and they so promptly react to the slightest degree of it as to shut out its further possibility. A comparison of the poor with the good cases indicates also that the poor have reacted to fatigue more than the latter. As was already seen in Table XII, the poorer cases, A, B, C, and I, increased their maximum rate over their natural rate less than did the others. In Table XIII, the average number of taps the good increased their maximum over their natural rate in the first quarter minute is 3.19. The same average for the poorer cases is 1.81. The average number of taps the natural rate of the poorer cases has decreased in the fourth quarter compared with the first quarter is 2.54. Their decrease for the maximum rate is 4.15. For the better cases these averages are 2.96, and 3.83 for the natural and maximum rates, respectively. But both these figures are too high on account of the exceptionally high decrease of 6.50 for G's natural rate, and the exceptionally high decrease of 7.78 for E's maximum rate. Thus the cases that stand higher in general development have kept up their rate better than the others in both natural and maximum rates, even though they have increased their maximum rate over their natural much more than the poorer cases did.

The tests in regulated tapping gave a rough means of determining during what part of the minute series their attention was best, by showing in what five-second intervals they get in the correct number of taps oftenest. The next table gives these results. In this table are given merely the number of times each case made the correct number of taps for the differ-

ent five-second intervals, from the first to the twelfth. The fig-

TABLE XIV.

	1	2	3	4	5	6	7	8	9	10	11	12
A	4	5	7	6	8	5	6	3	3	2	3	2
B	5	5	6	4	5	4	4	4	3	3	3	5
C	5	10	11	9	8	8	10	7	8	10	6	9
I	7	12	12	10	12	7	9	7	6	7	5	9
Av.	5.25	8	9	7.25	8.25	6	7.25	5.25	5	5.5	4.25	6.25
D	7	8	11	13	11	7	10.	13.	11	11	10	11
E	2	3	1	2	0	3	1	2	1	1	2	2
F	9	11	10	7	10	12	10	10	7	9	10	7
G	1	9	8	8	7	9	5	7	8	9	7	9
H	7	11	11	11	13	12	12	13	12	13	12	12
Av.	5.2	8.4	8.2	8.2	8.2	8.6	7.6	9	7.8	8.6	8.2	8
Gen. Av.	5.22	8.22	8.56	7.78	8.22	7.44	7.44	7.33	6.56	7.22	6.44	7.33

ures are based upon fourteen one-minute series for each case. Thus A, *e. g.*, had fourteen chances to make the correct number of taps for each of the five-second intervals, and got it correct 4, 5, 7, etc., times for the first, second, third, etc., intervals. In dividing the cases into poor and good again, there is one exception in each group in the test. I, although poor in general development, tapped very regularly, as will be remembered, and thus did better in the regulated series. E, although standing much higher, generally, for some reason could not do this test at all. But including the exceptions even, the averages in this table agree with what was to be expected from the preceding tables on fatigue and effort. The general averages for all cases show that their attention falls at least after the fifth five-second interval. The averages are from too small numbers to be very regular, yet in the two groups of cases it is seen that, although there are as high averages for the poorer cases during the first half minute as there are during the first half minute for the better ones, the averages during the last half minute drop decidedly more for the poorer cases. This goes to indicate that although their attention in its maximum may approach that of the better cases, it is less regular, and far less persistent. How much this change during the second half minute is due in both instances to muscular fatigue, and how much is really a fatigue of attention, cannot, of course, be said.

2. *Association and Discrimination Time.*

The means that can be employed in determining association time always involve some form of reaction. For the subject can manifest that he has an association only through speech, or through some other muscular movement. Consequently it is impossible to measure association time directly. The time that we do measure always includes the time that it takes to

give expression to the association. And, more important than this, we have no means of determining how much the particular mode of expression otherwise interferes with the associative process whose time we are attempting to measure. In considering the association time of feeble-minded children, the first thing that we need to bear in mind is the probability that the long association time that our figures will show is due more to their slow way of expressing their associations than to any slowness of the succession of imagery, because of the great lack of effort with which they proceed. For this reason I have classed the following tests under the heading of 'Attention and Effort,' rather than by themselves, although by the method employed, I believe a large part of the source of error mentioned has been eliminated.

Some experiments have been made on the association time of feeble-minded children. Johnson[1] employed the following method: A key word was called and the child was requested, in the written tests, to write down everything for thirty seconds that the word suggested. In the oral tests the suggestions were spoken. In a written test on fifteen children, average 15.8 years, he got an average association time of 8.3 seconds. In an oral test on thirty children, average age 13.3 years, he got an average of 5.35 seconds. On normal children Cattell and Bryant got, by the written method, an average of 4.5 seconds. Johnson got an average of 2.6 seconds for ten normal boys, by the oral method. Wreschner[2] has made a very exhaustive study of the associations of one case, age 22 years, using Sommer's classified list of words, designed for the purpose, for key words. He used the oral method. His main object was a qualitative study of the associations, and only the first association for the key word was recorded. Space will not permit a full statement of his results, but in his average the association time is somewhat lower than Johnson's with the oral method. It is clear, I think, that none of these figures are to be taken as measuring the actual association time. In the written tests the largest part of the time must have been taken by the writing, and when we remember that with feeble-minded children writing is, as a rule, apt to be more of a laborious task than with normals, this becomes still more evident. However, the figures do not lose their value when compared with the results of normals obtained under the same conditions. They are a fairly good measure of the degree of effort that has been put into the task.

In my own tests it was attempted to eliminate as far as possible the source of error that results from the lack of effort with which feeble-minded children proceed in any task. The re-

[1] Psycho-Asthenics, Vol. II.
[2] Allg. Zeitschr. f. Psychiatrie. Bd. 57, 1900.

sults themselves will show best how far this has been successful. The first test consisted in the child naming ten object pictures as fast as he could be made to do so. The pictures were those that had been used for over a month in the memory span test. They were placed upon the table before the child under a card-board cover. When ready the cover was quickly removed, and the child named the pictures as I pointed to them, they being pointed to at a slightly faster rate than he could name them, in order to further prevent his lagging in effort at any time. With the pictures, as in the following tests, ten trials were given to each case, but generally not more than one a day. In order to prevent their becoming weary of the test the days on which the trials were given were scattered at irregular intervals over about two months. The other tests consisted of discrimination-time tests. On twenty-five blank-faced playing cards were pasted five geometrical forms, cut from five different colored papers, so that each form appeared five times, once in each of the colors, and each color appeared five times, once in each of the forms. The colors were standard red, orange, yellow, green, and blue, and the forms a triangle, square, circle, diamond, and oblong, all solid and averaging about an inch in diameter. The first thing consisted in determining the mechanical time; that is, to see how long it would take the child to take hold of each of the twenty-five cards, turn it over, and place it upon the table. The cards were handed to the child as fast as he could take hold of them. The second time the child was requested to sort the cards into five piles, according to color. The third time he sorted them according to form. In all of the tests the time was taken with a stop-watch, and the usual means of encouraging a maximum rate were employed. In the discrimination-time tests three trials were given a day to each child, so that one trial on mechanical time, one on color discrimination, and one on form discrimination, came on the same day. Ten trials in all for each were given to each child, but scattered over two months of time, as in the tests on naming pictures. To parallel these discrimination-time tests with a similar one, the same procedure was repeated during the same two months with twenty-five object picture cards, five each of five different pictures, taken from the ten that were being used in the other tests. The mechanical time was also taken ten times for each child with the picture cards, they being less smooth and not so easily handled. The object of the discrimination tests was, first, to determine the time it would take the child to recognize a color, form or picture and associate it with its proper place on the table. The mechanical time involved in merely taking hold of the cards, turning them over and placing them upon the table

would be the same in all, so that the time in the mechanical time tests could be subtracted from the time in the other tests and obtain the actual discrimination time. Secondly, the tests were made with colors, forms and pictures because it was conceivable that this time might depend much upon the kind of stimulus used. It might be considerably shorter for things with which the child was quite familiar than for others. Table XV gives the results.

TABLE XV.

	A	B	C	I	Av.	D	E	F	G	H	Av.	Gen.Av.
Naming pictures,	1.60	1.30	1.35	1.62	1.47	1.79	1.19	2.03	1.06	1.39	1.49	1.48
Discrim. "	1.69	1.71	1.25	1.46	1.53	1.49	.99	1.69	1.28	1.54	1.40	1.46
" colors,	2.31	2.04	1.85	2.80	2.07	1.30	.90	1.34	1.23	1.29	1.41	1.67
" forms,	——	3.18	——	2.64	2.91	1.45	1.12	2.00	1.37	1.72	1.53	1.93
Averages,	1.90	2.06	1.48	2.13	2.00	1.51	1.05	1.78	1.24	1.49	1.46	1.64

These figures express the average time in seconds it took each child to name one picture, discriminate a picture, a color, and a form. A and C could not be taught to sort the cards according to form after they had done it once or twice according to color. For some reason that I could not determine, they seemed not to be able to understand what was wanted, would mix up all the forms when told to sort them, and could not be taught. Consequently the test had to be omitted for these two cases. On account of sickness, C's averages in the second and third horizontal columns are from seven and five trials, respectively, instead of from ten. On account of a partial red-green color blindness of I his average of 2.80 is left out of the general averages. The first thing to be noted about the results is the fact that they are decidedly lower than the lowest average Johnson obtained from children much older. The general average for all cases and all methods is only 1.64 seconds as against 5.35 seconds, the lowest average Johnson obtained. These low figures are perhaps in part due to the constant individual coaxing and encouragement each child received in my tests. But it is undoubtedly much more due to the other differences in the method. The averages are still higher than they would be with normals when the same method is employed, but it is also evident that the source of error resulting from lack of effort in performing the task has not been entirely eliminated. It is not eliminated in the test on naming pictures. And in the discrimination-time test it is not entirely eliminated in that in the mechanical-time tests they dropped the cards practically all on one pile, often hardly taking hold of them at all, while in the sorting tests they had to keep the cards separate in five piles, necessitating taking hold of each card properly and also a slightly greater arm movement. These matters considered, it becomes probable that their actual association time is not so very much longer than that of normals; at least it is evident

that the difference is not nearly so great as might have been supposed from previous results.

An interesting part of the results is the fact that their discrimination time is different accordingly as pictures, colors, or forms were used. The averages for all cases show that it is shortest for the pictures, and longest for the forms. The pictures were chosen as something with which they would be very familiar, they having used them a long time in the memory span test, and because they showed a decided interest in them, the object being to see whether familiarity and interest would have any effect upon their discrimination time. The results show that they did shorten it. Why the discrimination time for form should be longer than that for color is in part accounted for by the fact that their institutional training had laid somewhat more stress upon color training than form training. But another factor enters also in that form can be less easily discriminated in the peripheral field of vision than colors, and this had to be done when the five piles were kept separate on the table by a few inches. In comparing the discrimination time of the poor cases with the better ones again, it is seen that it is longer for the former, being 2.00 seconds in the general averages as compared with 1.46 seconds for the better cases. Furthermore, the difference in picture, color, and form discrimination time is considerably greater for the poorer cases. This fact is in accordance with the previous results in the memory span, in which it was seen that they could remember some pictures decidedly better than others. We shall see the same fact again in an attention span test.

These tests were not of a nature to show practice effect very much. And the element of getting tired of the task was quite effectively ruled out by scattering the tests over a long period.

3. *Attention Span.*

The attention span test consisted in determining how many things the child could see and recognize when those things were presented for a fraction of a second only, so that there was no opportunity for the attention to move from one to the other, but all had to be attended to simultaneously. The things presented were form and color, the same that were used in the discrimination-time tests, except that they were mounted on 6x8 card-boards to fit the apparatus. The apparatus was a large disk tachistoscope, set so that it would expose the form and color cards for something less than a fifth of a second. The cards were arranged in three groups, with five in each. On each of the five in the first group was one form in one color. Those in the second group had each two forms in two colors.

Those in the third group had each three forms in three colors. The combinations were as follows:

A					B					C				
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
R.t.	O.s.	Y.c.	G.d.	B.o.	B.t.	R.c.	O.c.	G.t.	B.d.	R.s.	Y.t.	O.t.	R.c.	B.t.
					G.s.	O.d.	Y.s.	Y.o.	R.o.	B.c.	B.s.	R.d.	Y.d.	G.s.
										G.d.	G.c.	Y.o.	O.o.	R.o.

A, B, and C = the card groups. 1, 2, 3, etc., = the 6x8 cards on which forms and colors were pasted. R, O, Y, G, and B = red, orange, yellow, green and blue. t, s, c, d, and o = triangle, square, circle, diamond, and oblong. Each of the fifteen cards, excepting 6, was shown once a day to each case for ten successive days, with an interval of three days after the fourth day. To study a practice effect card 6 was shown three times a day instead of once. In the experiment the child was seated at the table with his eyes at about the level of the position of the cards in the tachistoscope. The distance varied from ten to twenty inches, each child being allowed to suit himself, within these limits. Before the child on the table in front of the tachistoscope were placed the forms and colors used on the cards 1 to 15, but mounted on blank playing cards, one on each. Their number was never greater than twelve to fifteen. When all was ready the child was told to watch, his attention being called by tapping the part of the disk behind which the card would be exposed. When his eyes were upon the spot, which could be readily seen by the observer, the disk was turned and the exposure made. The child then picked out the forms and colors he thought he had seen, from those before him on the table.

During the tests it was found that the imagery, in terms of which the child recognized the forms and colors and by which he picked them out, differed very widely with the different cases. Not all knew all the form and color names, but all knew some. A few knew all but could not apply them correctly. Several used the color name in remembering them to pick them out, but none used any form names in this way, so far as I could find out. Thus, each apparently made a different use of the color word image, the form word image, the color visual, and form visual image. A named all the colors correctly, and also the forms, excepting the diamond. He remembered the colors by their word images, the forms probably by visual images. B named all the colors and all the forms correctly, remembered colors by the word images, but not the forms. C knew a few color names but did not always apply them correctly. He knew no form names. Consequently word images probably played no part in his memory and recognition. D used all the color and all the form names correctly, but did not

use the form names in remembering; he probably used the color names somewhat. E named all the colors correctly except blue and yellow. He knew all the form names, but applied them wrongly. Word imagery probably played little or no part in his memory. F named all colors and forms correctly readily, but did not use the form names in remembering. G named the colors correctly, knew all the form names, but applied all but 'round' and 'square' wrongly. It is doubtful whether he used color names in remembering. H named all colors and forms correctly, but did not use form names in remembering. I was considerably red-green color-blind. He knew all the color and form names, but applied none correctly always. The results on the attention span are given in the next table. The figures in this table are the average number of mistakes each case made for each card group.

TABLE XVI.

	A	B	C	I	Av.	D	E	F	G	H	Av.	Gen. Av.
A	.08	.06	.10	.04	.07	.04	.04	.14	.02	.02	.05	.06
B	1.63	1.35	1.75	1.20	1.48	1.20	.83	1.18	.45	1.03	.94	1.21
C	2.50	1.90	2.54	2.70	2.41	1.90	2.14	2.34	1.94	2.08	2.08	2.25
Av.	1.40	1.10	1.46	1.30	1.32	1.05	1.00	1.22	.80	1.04	1.02.	

It will be remembered that card group A had five cards, each with one form in one color, and that each of the cards was shown ten times to each case. Thus the .08 for case A is the average number of mistakes he made with one form in one color, in fifty trials with the same. His 1.63 is the average number of mistakes he made with two forms in two colors, etc., for the other cases. In the horizontal B-column, however, the averages are from four cards only, instead of five, the results from card 6 being omitted on account of their being different because it was shown thirty times instead of ten times to each case for practice effect. No corrections have been made in the table for the chance error due to the forms and colors being picked from as small a number as twelve to fifteen. From the figures it is seen that the attention span, under the conditions of the test, lies in the neighborhood of three. Thus in the general average for all cases they have made 1.21 mistakes when four things were presented, two forms in two colors, and 2.21 mistakes when six things were presented, three forms in three colors. The C-card group was clearly entirely beyond them, since they got less than four correct, on the average, out of six. On the other hand, the small error of .06 for the A-card group must, of course, be regarded as the result of occasional accidents, and not as meaning that their attention span was slightly less than two, one form in one color. Comparing the poorer with the better cases, the average number of errors

is greater for the former, the difference being .02, for the A-card group, .54, for the B-card group, and .33, for the C-card group.

Three cases, A, B, and F, made more mistakes in form than in color. Of all the others the reverse is true. However, the differences are not great enough to show any decided preference for one or the other. From the fact that none of the cases used form names in remembering forms, so far as could be determined, and that all of them used color names it might have been expected that most mistakes would have been made with forms. But too many other factors entered to judge what the effect of this could have been.

A more marked influence than that of color as a whole, or form as a whole is seen when the individual colors and individual forms are compared with each other with reference to the number of mistakes that were made with each in choosing it when it had not been shown, and in not choosing it when it had been shown. Table XVII will show that most of the cases had two or more decided color or form preferences. That is, they would choose one color or form wrongly much more frequently than another, or fail to see it more frequently than another. The results are expressed in percentages.

TABLE XVII.

	R	O	Y	G	B	Av.	M.V.	t	s	c	d	o	Av.	M.V.
A	33	38	47	24	38	36	6.00	24	25	47	45	58	39.8	10.24
	39	50	18	33	31	34.2	8.24	31	46	40	38	32	37.4	4.72
B	21	18	8	38	25	22	7.60	21	33	48	18	27	29.4	9.08
	21	34	33	16	18	24.4	7.52	20	33	28	32	35	29.6	4.48
C	27	46	45	34	25	35.4	8.08	21	28	57	17	50	34.6	15.12
	53	26	25	38	36	35.6	8.08	35	33	32	43	25	33.6	4.32
D	23	18	28	30	30	25.8	4.24	23	15	56	12	20	25.2	12.32
	36	36	28	23	13	27.2	7.36	23	15	17	32	32	23.8	6.56
E	23	42	35	24	15	27.8	8.56	20	16	32	20	28	23.2	5.44
	20	30	17	30	33	26.0	6.00	13	38	25	10	30	23.2	9.36
F	31	36	35	13	31	29.2	6.48	39	26	45	27	50	37.4	8.72
	20	40	25	40	15	28.0	9.60	19	54	28	47	23	34.2	11.04
G	14	28	17	15	18	18.4	3.84	20	8	8	5	27	13.6	7.92
	19	16	20	18	14	17.4	1.92	8	13	14	22	12	13.8	3.36
H	21	12	27	30	24	22.8	5.04	14	41	13	20	10	19.6	8.72
	30	38	30	13	15	25.2	8.96	20	14	17	33	20	21.0	5.00
I	60	28	37	15	41	36.2	11.76	16	20	35	30	48	29.8	9.44
	34	40	40	40	29	36.6	4.08	35	33	23	20	28	27.8	5.04
Av.	28.1	28.4	31.0	24.8	27.4			22.0	23.6	37.9	21.6	35.3		
"	30.2	34.4	26.2	27.9	22.7			22.7	31.0	24.9	30.8	26.3		

The first horizontal column for each case gives the percentage of the number of times each color and form was chosen wrongly, chosen when it had not been shown. The second horizontal column for each case gives the percentages of the number of times each was not seen or chosen when it had been shown. The averages are averages of the figures in the table. In the

M. V. columns are given the mean variations from the averages. These mean variations measure the extent to which color and form preferences have been present; they being large, of course, when one or two colors or forms have been chosen wrongly or not seen very much more than the others. The averages at the foot of the table show the relative objective value the different colors and forms have had in the attention span, that is, whether there was anything inherent in any particular color or form that would cause it to be chosen wrongly or overlooked by all cases more frequently than others. These averages show that there has been no serious difference between them with reference to this matter. Of the colors blue has been least overlooked, and this was probably due to the fact of its greater contrast on the white background upon which all were mounted. Among the forms the circle and the oblong were chosen wrongly considerably more frequently than the other forms. It is more likely, however, that this was due not to a difference in objective value but rather to a difference in subjective attitude of all the cases towards these forms through associating them with things in which they had greater interest. The oblong was called 'egg-shape' by most of the cases, and the circle a 'ball.' Thus, as a rule, color and form preferences have been quite an individual matter, each case having his own. For particular illustrations, and their extent, the table itself must be studied. It will be seen that in by far the majority of instances in which a color or form has been chosen wrongly very frequently, the same has been overlooked less frequently and *vice versa*. Thus of the ninety instances in the table it is only in twenty-seven of them that both percentages stand above or below the average. The best instances of preferences are found in C and D. Thus D chooses the circle wrongly 56% and overlooks it only 17%, with corresponding averages for form at 25.2% and 23.8%. In comparing the poor with the good cases, with reference to preferences, the exceptions are so great as to make the averages somewhat doubtful. Though it is true that nearly all of the mean variations for the poorer cases are high, and that the lowest mean variations are found with the better cases, there are several very high mean variations with the latter, especially D and F.

The interpretation of color and form preferences in this test must be the same as that of the preferences found to be present in the memory-span test with pictures, and the discrimination-time test with colors, forms, and pictures. The facts are exactly parallel to those of the memory-span test.

The attention-span test afforded some opportunity for a study of practice effect. It will be remembered that card 6, in group B, was shown three times as often as any of the others. The

purpose of this was to see whether, by repetition, they would learn to associate the four things in this card, blue triangle and green square, so that when they saw one they would be certain of the others. Table XVIII gives the results.

TABLE XVIII.

	A	B	C	I	Av.	D	E	F	G	H	Av.
Av. for card 6,	1.63	.90	1.13	1.23	1.22	.63	1.03	1.33	.07	.13	.64
Av. for cards 7-10,	1.63	1.35	1.75	1.20	1.48	1.20	.83	1.18	.45	1.03	.94
Per cent. gain,	0	33	35	-3	16.3	48	-24	-13	84	87	36.4

The figures are again the average number of mistakes made by each case with card 6, in the first column, and with cards 7 to 10, inclusive, in the second column. These averages show that they have learned, to various extents, the combination in card 6. The exceptions to the rule of improvement in I, E, and F are quite unaccountable. But the percentages of gain or improvement for card 6 are decidedly less for the poor cases than for the better. Even taking the large exceptions of E, and F into account, the average percentage improvement for the better cases is 36.4, as against 16.3, for the poorer cases.

In comparing the number of mistakes made in the first half of the test, the first five days, with the number made in the last half, the last five days, some practice effect is seen also. Table XIX gives the results.

TABLE XIX.

	A	B	C	I	Av.	D	E	F	G	H	Av.	Gen. Av.
First half,	126	107	129	132	124	96	89	110	61	79	87	106
Second half,	117	72	107	90	97	75	84	113	57	70	80	85
Per cent. gain,	7	33	17	32	22.2	22	6	-3	7	11	8.6	15.4

This shows that there has been in this test a considerable improvement with practice. It is, however, not to be taken as a contradiction of results in the other tests, which indicate that their practice curve goes downward instead of rising, as due to their becoming tired of the work. Undoubtedly they also became tired of the present test. But the occasion for improvement was greater in this test than in the throwing and tapping tests, enough greater to overbalance the effect of the other factors. The table also shows that the amount of improvement for each case has been more dependent upon his proficiency in the beginning than upon the general grade of the case. The poorer cases have improved much more, on the average, than the better ones. In one instance this can be accounted for by direct observation. Case I made 132 mistakes during the first half and only 90 during the last half. This was due to the fact that at first he so frequently chose forms of the same color. Thus in the C-card group, in which three forms in three colors

were shown at a time, he would see one of the three colors and then pick out the required number of forms in the color he had seen, resulting in a large number of mistakes. This he finally learned not to do, and consequently his great improvement in the number of mistakes made during the last half of the test. As for the others, it is possible that it took the poorer cases longer to learn that never more than one of the same color or form was shown at a time. It is true at least that most of the better cases learned this at once. And this once learned, the occasion for improvement was decidedly lessened.

D. Domino Discrimination Test.

In general, in the discrimination of elements in a complex phenomena more factors entering into general ability are involved, perhaps, than in most any other kind of task. To this extent the ability to discriminate should be a fairly good measure of the general grade of the case. In the present test it was aimed to get a simple task of discrimination, and to supply the conditions that would make it possible to determine what factors entered in making discrimination good or poor. Two sets of double-nine dominos were used. Each set was divided into five series of ten each, so that those with the least number of spots were in the first series, and those with the most spots in the fifth. The series were used in their order from first to fifth. In the test the ten in a series from one set were placed in a small circle on the table before the child. One from the same series from the other set was placed in the centre of this circle and the child told to find the one like it in the circle as quickly as possible. The usual encouragement to go fast was employed. As soon as the child picked up the right one the one in the centre was replaced by a second, and he was told to find that one, etc., until the series was completed. If he picked the wrong one he was told that it was wrong, and the one taken was recorded. The time that it took him to complete a series of ten was taken with a stop-watch. Each series of ten was given to each case four times, unless he made no mistakes at all in the first two trials. If he got them all correct the first two times it was taken that he could discriminate all in that series perfectly. There were a few exceptions in this procedure which will be noted in connection with the statement of the results.

In the next table are given the results on the average number of mistakes each case made in each series, and the average length of time it took him to complete that series. The first vertical column for each of the five series of ten dominos for each case gives the average number of mistakes he made for the respective series. The second vertical column

TABLE XX.[1]

	I.		II.		III.		IV.		V.			
	M.	T.	M.	T.	M.	T.	M.	T.	M.	T.	AV.	AV.
A	1.5	——	2	6:10	.75	7:00	1	7:01	1.5	14:24	1.35	8:39
B	0	3:25	.5	4:21	1.25	2:29	.5	3:03	0	3:38	.45	3:23
C	3	——	5.75	6:17	2.50	6:04	.5	4:05	——	——	2.94	5:29
I	2.75	4:33	4.00	6:38	1.75	6.07	3.25	4.05	2.0	6:09	2.75	5.38
Av.	1.44	3:59	3.06	5:52	1.56	5:20	1.31	4:34	1.17	8.04	1.87	5:34
D	0	——	0	1.45	0	2:20	0	2:53	.5	3:41	.10	2:40
E	.25	——	.25	2:32	0	3:01	.5	3:33	0	3:08	.18	3:04
F	0	——	.5	3:28	0	3.02	.5	4:20	2.0	3:47	.60	3:39
G	0	1.25	0	2:13	0	2:10	0	2:35	0	2:35	0	2:12
H	0	——	0	2:38	0	2:53	0	3:24	3.0	4:06	.60	3:15
Av.	.05	——	.15	2:31	0	2:41	.20	3:21	1.10	3:27	.30	2:58
Gen Av.	.65	——	1.71	4:12	.78	4:01	.76	3:58	1.14	5:46	1.09	4:16

for each of the five series gives the average time it took each case to complete the series. Thus in the first series B made no mistakes, and it took him three minutes and twenty-five seconds, on the average, to go through that series once. It can undoubtedly be taken safely for granted that the normal child of their age would make no mistakes at all in discriminating dominos. The first point of interest, therefore, is that these children do make mistakes. And, secondly, the number of mistakes they make runs quite closely parallel with their degree of general development. The average number of mistakes made by the four poorer cases is 1.87, for the better cases it is only .30. Again, the time it takes them to go through a series of ten in this way is also closely proportional to the degree of general development, the general averages being 5:34 for the poorer, and 2:58 for the better cases. The best of the nine cases, G, has made no mistakes and has also the shortest time, 2:12.

A study of the character of their mistakes is more instructive. They fall into two general classes. By far the majority of mistakes were due to their overlooking one end of the block. They would get one end correct, and in the recognition of this much would forget about the other end. A much smaller number of mistakes was made through choosing by general appearance, instances of real inability to discriminate. Thus, they would fail to discriminate between a four and a six, a five and a seven, an eight and a nine, etc., on account of their similarity of appearance.

[1] It did not occur to me at once that it would be valuable to take the time it took them to go through a series, consequently no record was kept of this at first. For C the fifth series was omitted on account of sickness.

Summary.

1. They have a very great lack of persistent effort and attention. They are distracted both by external stimuli, things in their surroundings, and by their own imagery and motor habits. (General description of cases, especially cases A, B, and F.)

2. In relating things from memory they mingle facts and imagination, probably as a result of their effortless thinking and a tendency to follow their spontaneous suggestions. (Results from general orientation questions, p. 402.)

3. The memory span with pictures lies between two and three, and changes with the grade of the case. (Table II.)

4. A high memory span for pictures is not correlated with great memory permanency through an interval of several weeks. (Tables I and II.)

5. They show decided memory preferences, remembering some things much better than others. The degree of memory preference changes with the grade of the case, being greater for the poorer ones. With the method employed, the pictures that are forgotten most are chosen wrongly least, and those that are forgotten least are chosen wrongly most. (Tables III and IV.)

Memory preferences are probably due to differences in interest for the different things. (p. 412.)

6. In throwing at a target their practice curve goes down after the second week (Table V) through a decreasing interest in the work, and rises again when that interest is artificially aroused. (Table VI.)

7. The amount of daily variations in the throw for each week runs parallel with the quality of the throw, correlating high daily variations each week with good throwing, and low daily variations with poor throwing. (Tables IX and V.)

Daily variations are due to changes in the daily disposition. From this (6 and 7) it appears that a favorable disposition does not alone affect the quality of their work in a particular task (their surplus energy is expressed in other directions), but does so only when interest in the particular task is aroused, and, secondly, that interest can be aroused only when the general disposition is favorable. (pp. 419-420.)

8. Most cases show a constant error, throwing more in one quadrant of the target than in another, and, with most, this constant error decreases with practice. (Table VII.)

9. The regularity of their throw increases with practice; they miss the whole target less after a while, and also hit the centre less after a while than at the beginning. (Table VIII.)

10. In a minute series of tapping on a re-action key in uni-

son with a metronome beating half or whole second intervals, their practice curve goes down after the first day. (Table X.)

This decline is due to a lowering of interest. (p. 422.)

11. they get in the right number of taps slightly over half the time, when the taps are grouped for five second intervals. (Table X.)

12. In general, those whose natural rate of tapping was nearest the regulated rate, and whose tendency to vary their natural rate was least, showed the greater ability to follow the regulated rate correctly. (Table XI.)

13. The factors that entered in making them fail to keep up the regulated rate of tapping are, (a) inability to keep up the effort, (b) distractions by being attracted by things in their surroundings, and by their own irrelevant imagery and motor habits, and (c) inability to overcome their natural rate of tapping. (p. 422 and Tables X and XI.)

14. Their average maximum rate of tapping is only slightly above their average natural rate, 1.64 taps per five seconds. This difference increases with the grade of the case. Table XII.)

15. Both their natural and their maximum rates drop after the first fifteen seconds, and the two are practically alike by the third fifteen seconds of a minute series. (Table XIII.)

16. In the regulated tapping they do best after the first five seconds, and poorest during the first five seconds and the last half minute of the minute series. This tendency to do poorer during the last half minute is greatest for the poorer cases. (Table XIV.)

From this (14, 15 and 16 especially) it follows that they are almost absolutely incapable of any genuine voluntary effort in a task that they dislike, and that normal fatigue under such circumstances is impossible with them. (pp. 424-428.)

17. Their average association and discrimination time with the methods employed is 1.64 seconds. (Table XV.)

18. This time varies very much with the method emploedy. (p. 428-429 and Table XV.) It is shorter for things with which they are more familiar and have the greater interest, shorter for familiar pictures than for colors, and shorter for colors than for forms. It changes with the grade of the case, as does also the difference for the different methods. (Table XV.)

The time obtained with any method is probably much too long, and does not express the real association time because of the lack of effort with which they proceed in any test. (p. 429.)

19. Their attention span for form and color, and with an exposure of one fifth to one sixth of a second, lies between two and three. It increases with the grade of the case. (Table XVI.)

20. Making more color than form, or more form than color mistakes is an individual matter with each case. Four cases made more color than form mistakes, five more form than color mistakes. (p. 435.)

21. They have color and form preferences, choosing some wrongly more than others, and not seeing some oftener than others. In most instances the colors and forms that are chosen wrongly most are also those that are not seen least, and those that are chosen wrongly least are those that are not seen most. (Table XVII.)

The explanation for this is the same as that for memory preferences for pictures. (p. 436.)

22. Their attention span is raised with practice through their learning the combinations of forms and colors presented (Table XVIII), and probably also in other ways (Table XIX). Their ability to learn the combinations increases very much with the grade of the case. (Table XVIII.) Their general improvement is dependent more upon their lack of proficiency in the start, and is greatest for the poorer cases. (Table XIX and p. 437.)

23. They cannot discriminate dominos from each other by the number and arrangement of spots, at first, but learn to do so in time. The number of mistakes they make, and the time it takes them to match a given number varies very much with the grade of the case. (Table XX.)

24. The character of their mistakes falls into two classes: (a) overlooking one end of the block, more frequent, and (b) failing to discriminate in cases of similarity of general appearance, less frequent. (p. 439.)

The present investigation was undertaken at the suggestion of Prof. E. C. Sanford. It is a pleasure to acknowledge my indebtedness to him for constant advice and many valuable suggestions. Also to Dr. Alexander F. Chamberlain, Acting Assistant Professor of Anthropology, Clark University, for making the physical measurements of the cases for me; to Dr. J. W. Slaughter, Docent in Æsthetics and the Philosophy of Evolution, Clark University, for helping me in giving the tests; to Dr. Walter E. Fernald, Superintendent of the Massachusetts School for Feeble-Minded Children, for permission to work on the cases, and for the use of his fine special Library; to Dr. Wallace and Dr. Ladd, physicians of the institution, for selecting representative cases for me; and to matrons and attendants of the institution for helping me in various ways.

Appendix and Bibliography.

The literature on arrested development is voluminous. I

have not attempted to give any statement of it, and shall not do so now. In 1891 Sollier writes in the preface to his "Psychologie de L'idiot et de L'imbecile" as follows: "The bibliography on idiocy, very poor in France, very rich, to the contrary, in America and England, consists especially of documents on the causes, the classifications, physical signs, the pathological anatomy, and education of idiots. Men have concerned themselves but little with the psychological side, or have repeated what has been often noted." Speaking of his own book he says: "It is the first of the kind, to our knowledge, that has been attempted." Since Sollier's writing much, indeed, has been published on their psychology; far too much, in fact, to improve the disposition of those who attempt to make use of the bibliography. For Sollier's criticism on the character of the psychological literature still holds true. Some books, quite a list of monographs, and many articles on the psychology of arrested development have appeared during the last ten years. But, with a few exceptions, it may be said of all of them that they are based upon general observations only, and deal with repetitions of a relatively few facts that can be readily observed by any one, or that have been frequently stated. It is not my intention to depreciate the value of these observations; they are undoubtedly valuable. But they are not the results of a method that can take us very far into the real science of this branch of mental pathology. The time has come in this field, too, for general observation to take a subordinate place to the more refined procedure of experimentation. Upon the basis of its success and its results we both feel the need, and can judge somewhat the possibility of experimental study. Some experimental work has been done. But it is very little, and the method has hardly as yet seen its beginning in this field. Most of its results have been quoted, or referred to above; the whole is not sufficient to justify a review.

I shall not attempt to give a complete bibliography on all the phases of the subject. Such would be quite useless on account of its very cumbersomeness. But for the sake of keeping the literature somewhat in view, references are given, first, to the larger bibliographies and then to the special works arranged chronologically.

Index Catalogue of the Library of the Surgeons-General's office, U. S. Army. Vol. VI, 1885, pp. 775-782; and Vol. VII. (Second Series), 1902, pp. 816-827.

Index Medicus. Vol. I, 1879, to Vol. XXI, 1898-'99; and Vol. I, 1903. References to the different phases of mental and neural pathology of arrested development will be found *passim*.

Bibliographischer Semesterbericht der Erscheinungen auf dem Gebiete der Neurologie und Psychiatrie. Vol I, 1895, to Vol. IV, 1898. References will be found *passim*.

Jahresbericht über die Leistungen und Fortschritte auf dem Gebiete der Neurologie und Psychiatrie. Vol. I, 1897, pp. 1218-1219. Vol. II, 1898, pp. 1167-1169. Vol. III, 1899, pp. 1097-1098. Vol. IV, 1900, pp. 945-946. Vol.V, 1901, pp. 865-866. Gives digests of the more important articles, etc.

Psychological Index. No. 1, 1894, 'Insanity, Idiocy, and Imbecility.' Nos. 1214-1260. No. 2, 1895, do., Nos. 1256-1305. No. 3, 1896, do., Nos. 2017-2079. No. 4, 1897, do., Nos. 2237-2321. No. 5, 1898, do., Nos. 2255-2388. Nos. 6, 1899, do., Nos. 2344-2451. No. 7, 1900, 'Idiocy, Imbecility, etc.,' Nos. 21-93-2201. No. 8, 1901, 'Idiocy, Imbecility, and General Paralyis,' Nos. 2402-2464. No. 9, 1902, do., Nos. 2074-2110.

L'année psychologique. Vol. I, 1894, *passim*, Nos. 1-1217. Vol. II, 1895, 'Aliénation, Idiotie, et Imbécilité,' Nos. 1256-1305. Vol. III, 1896, 'Insanité, Idiotie et Imbécilité,' Nos. 2017-2079. Vol. IV, 1897, do., Nos. 2237-2331. Vol. V, 1898, do., Nos. 2255-2388. Vol. VI, 1899, do., Nos. 2344-2451. Vol. VII, 1900, 'Idiotie, Imbécilité,' Nos. 2193-2201. Vol. VIII, 1901, 'Idiotie, Imbécilité et Paralysie générale,' Nos. 2402-2464.

Neurologischer Centralblatt. Beginning with Vol. 20, 1901, this gives a monthly, or bi-monthly classified bibliography, including sections with references on mental and neural pathology of arrested development.

Only a small percentage of the literature is psychological. During the last few years methods of training, and pedagogical principles to be applied in rearing these defectives have received a large amount of attention; perhaps an undue amount. The following references include books, monographs, and some of the more important articles concerned with their psychology and pedagogy. They are based upon general observations, and are written for the most part for superintendents, physicians, and instructors in the special institutions, and for parents.

BOURNEVILLE. Recueil de memoirs, notes et observations sur l'idiotie. Paris, 1891.

SOLLIER. Psychologie de l'idiot et de l'imbecile. Paris, 1891.

UFER. Das Wesen des Schwachsinns. Langensalza, 1892.

TRÜPER. Psychopathische Minderwertigkeiten im Kindesalter. Gutersloh, 1893.

VOISIN. L'idiotie, hérédité et dégénérescence mentale, psychologie et education de l'idiot. Paris, 1893.

The Feeble-Minded Child and Adult. A Report on an Investigation of the Physical and Mental Condition of 50,000 School Children, with Suggestions for the better Education and Care of the Feeble-Minded Children and Adults. London, 1893.

CRAMPE. Ueber zwei Fälle von Imbecilität. Berlin, 1894.

SEGUIN. Rapport et mémoires sur l'education des enfants normaux et anormaux. Paris, 1895.

SHUTTLEWORTH. Mentally Deficient Children. Their Treatment and Training. London, 1895.

DILLNER. Ergebnisse ärztlicher Untersuchung schwachsinniger Kinder und ihre Bedeutung für den Lehrer. Zeitschr. f. d. Behandl. Schwachsin. u. Epilept. 1896, n. F. VII. Also Med-pädagog. Monatschr. 1897; 49, 89, 119.

KREISLSHEIMER. Ueber Idiotie und Imbecilität. Strassburg, 1896.

PETERSON. The Psychology of the Idiot. Proceed. of Am. med-psyc. Assoc. Utica, 1896.
KALISCHER. Was können wir für den Unterricht und die Erziehung unserer schwachbegabten und schwachsinnigen Kinder thun? Berlin, 1897.
MÖLLER. Ueber Intelligenzprüfungen, ein Beitrag zur Diagnostik des Schwachsinns. Berlin, 1897.
REINKE. Die Unterweisung und Erziehung schwachsinniger Kinder. Berlin, 1897.
IRELAND. Mental Affections of Children; Idiocy, Imbecility, Insanity. London, 1898.
LIEBMANN. Die Untersuchung und Behandlung geistig zurückbleibener Kinder. Berlin, 1898.
BERKAN. Ueber die angeborenen und früh erworbenen Schwachsinn. Braunschweig, 1899.
FUCHS. Schwachsinnige Kinder, ihre sittliche und intellectuelle Rettung. Eine Analyse und Charakteristik, nebst theoretischer und praktischer Anleitung zum Unterricht und zum Erziehung schwachsinniger Naturen. Gutersloh, 1899.
KRAEPELIN. Psychiatrie. Ein Lehrbuch für Studirende und Aerzte. II, Band. Klinische Psychiatrie. pp. 573-601. Leipzig, 1899.
LIEBMANN. Geistig zurückbleibener Kinder. Archiv f. Kinderkrankh. Bd. XXVII, H, 1-2, 1899.
SCHENKER. Beobachtungen an schwachsinniger Kinder mit spezieller Berücksichtigung der Aetiologie und Therapie des Schwachsinns. Aran, 1899.
SIOLI. Referat über die Imbecillität. Neurol. Centrallblat, 1899.
SUTHERLAND. Mongolian Imbecility in Infants. Edinb. Med. Journ., 1899.
BUCHHOLZ. Ueber die Aufgaben des arztlichen Sachverständigen bei der Beurtheilung Imbeciller. Allg. Zeitschr. f. Psychiat., 1900.
LIEBMANN. Vorlesungen über Sprachstörungen. Uebungstafeln für zurückbleibene Kinder. Berlin, 1900.
STÖRRING. Vorlesungen über Psychopathologie in ihrer Bedeutung für normale Psychologie mit Einschluss der psychopathologischen Grundlagen der Erkenntnisstheorie. pp. 380-400. Leipzig, 1900.
WEYGANDT. Die Behandlung idiotischer und imbeciller Kinder in ärztlichen und pädagogischer Beziehung. Wurzburg, 1900.
DEMOOR. Die anormalen Kinder und ihre erziehliche Behandlung im Haus und Schule. Altenburg, 1901.
LAQUER. Die Hilfschulen für schwachbefahigte Kinder, ihre ärztliche und sociale Bedeutung. Wiesbaden, 1901.
LIEBMANN. Sprachsörugen geistig zurückbleibener Kinder. Abhdlg. aus dem Gebiete der padagog. Psychol. u. Phy., 1901.
MAUPATE. Langage chez les idiots. Ann. médico-psychol., 1901, 35, 225, 387.
NOYES. An Introduction to the Psychological Study of Backward Children. N. Y. Med. Journ., 1901.
SINELL. Geistig zurückbleibener Kinder und ihre Behandlung. Aerztlicher Verein zu Hamburg. Sitzung von 2 Juli, 1901.
DOLL. Aerztliche Untersuchungen aus dem Hilfschule fur schwachsinnige Kinder zu Karlsruhe. Karlsruhe, 1902.
LAQUER. Ueber schwachsinnige Schulkinder. Sammlung zwangloser Abhandlungen aus dem Gebiete der Nerven- und Geistes-Kranken. 1902.
LIEBMANN. Die sprachliche Entwicklung und Behandlung geistig zurückbleibener Kinder. Zeitschr. f. päd. Psychol., Pathol. u. Hygiene, 1902, IV, 2.

TRÜPER. Die Anfange der abnormen Erscheinungen im kindlichen Seelenleben. Altenberg, 1902.

The results of the purely experimental work that has been done will be found in the following references:

GALTON. Notes on Prehension in Idiots. Mind, 1887.
JOHNSON. Contribution to the psychology and pedagogy of feeble-minded children. Psycho-Asthenics, Vols. I, 4, II, 1, 2, 3.
LOBSIEN. Einige Untersuchungen über das Gedächtniss bei Schwachbefähigten. Die Kinderfehler. Zeitschr. f. Kinderforschung. Bd. VIII, H. 4, 1903.
KELLY. Psychophysical Tests of Normal and Abnormal Children. A Comparative Study. Psyc. Rev., Vol. X, 1903.
WYLIE. Taste and reaction time of feeble-minded. Psycho-Asthenics, Vol. IV, 3.
A study of the senses of feeble-minded. *Ibid.*, IV, 4.
Memory of feeble-minded. *Ibid.*, V, 1.
Motor ability and control of feeble-minded. *Ibid.*, V, 2.
HELLER. Ermüdungsmessungen an schwachsinnigen Schulkindern. Weiner med. Presse, Nos. 11, 12, 13, 1899.
WRESCHNER. Eine experimentelle Studie über die Association in einem Falle von Idiotie. Allg. Zeitschr. f. Psychiat., Bd. LVII.

LITERATURE.

THE FIRST GERMAN CONGRESS FOR EXPERIMENTAL PSYCHOLOGY was held at the little town of Giessen from the 18th to the 21st of April. Its numerous attendance was derived from very varied professions; psychologists, philosophers, psychiatrists, physicians, surgeons, philologists, teachers and clergymen, all seemed to find in the present topic one common meeting ground. Although the Congress was national and proceedings were confined to the German tongue, nevertheless representatives were to be seen and heard, not only from Austria and Switzerland, but also from France, England, Norway, Sweden, Holland, Russia, and even from the more remote United States, Canada, Egypt and Japan.

An agreeable feature of the meeting was its remarkably business-like character. The spiritualism and other "occult" phenomena in evidence at the previous international Congresses had disappeared from the programme; contention as to the primary method of psychological research had given way to a frictionless co-operation from all sources; visionary speculations had been wholly replaced by simple exposition of observed facts and explanatory theories. This satisfactory tone must be credited in large measure to the energetic steps of the managing committee, who had restricted discussion to experimental work and membership to such persons as had already published researches of scientific value.

The great wealth of subject-matter precludes attempt in our limited space at any systematic description; we must content ourselves with brief indication of a few salient features. As usual, the largest share of attention fell to the sensory functions, these obviously constituting the region most readily accessible to experimental treatment. A long and important paper was read by G. E. Müller on color-vision, advocating Hering's theory but in a modified and much more elaborate form; the processes in the retina itself were fundamentally opposed to those in the adjoining afferent nervous apparatus. Ebbinghaus discussed some familiar visual illusions, stating that he had found their exact counterpart in the sense of touch also, so that they could not be due to peculiarities in any of the peripheral organs or in the subcortical co-ordination of movements, but must arise from purely intellectual adaptation (Einstellung). Another favorite topic was Memory; in this sphere, we were introduced to a new mathematical prodigy, Dr. Rückle, who, among many other feats, far surpassed all previous record by memorizing in thirteen minutes a series of no less than 204 figures. Miss Gordon (United States) produced some experimental evidence to the effect that—contrary to the usual opinion—neither pleasant nor unpleasant impressions are remembered any better than indifferent ones. Claparède propounded a new theory of sleep; it was no longer to be regarded as a mere cessation of function in consequence of exhaustion, poison, etc., but rather as a positive reflex occurring instinctively in order to obviate such exhaustion. Weygandt had demonstrated upon himself the practically interesting fact, that a short sleep will perfectly renew capacity for easy intellectual performances, whereas much longer repose is indispensable to restore

functions which demand greater effort of attention. Henri related his experiences in conjunction with Binet as regards "individuality;" he enumerated the various brief mental tests which they had employed for this purpose; all, however, had proved unsatisfactory, and now they could only recommend long systematic investigation of each subject. The present writer sketched out some general improvements in the method of calculating psychical correlations. Külpe read a valuable paper on Abstraction, showing experimentally its paramount rôle in all apperceptive mentation. The youthful experimental science of Testimony (Aussage) was represented by Stern and Fräulein Borst, who dealt particularly with the different reminiscent accuracy of things heard as compared to things seen, of written testimony as compared to oral, and with the comparative reliability of men, women and children; above all, they pointed out the need that children should be taught to testify. Other papers were read—many of them very important—by Schumann, Guttmann, Tschermak, Benussi, Stern, Struyken, Alrutz, Heymans, Wreschner, Ranschburg, R. Müller Elsenhans, Ach, Martius, Ettlinger, Groos, Siebeck, Marbe, Ament, Lay, Exner and Watt. Several who had promised contributions, including Stumpf, Meumann, and Ziehen, had unfortunately been prevented from attending.

The other and at least equally interesting part of the proceedings consisted in an exhibition of apparatus. Martius showed an arrangement for transmitting light rays in exactly measurable quantity and duration. Three new tachistoscopes were presented, each with a special advantage; that of Erdmann and Dodge brought the whole field to view with perfect simultaneousness; in Schumann's, the object to be seen was immediately followed by a bright light, which destroyed the after-image and thus secured real momentariness of vision; while Wirth's mirror permitted instantaneous change of any desired portion of the regarded card (or other optical stimulus). Wirth, Ranschburg and Alber exhibited instruments for exposing a number of syllables, figures, colors, etc. in continuous succession, as a test of perception or memory. Zeiss showed a new stereoscope with micrometer. Stern's Tonevariator proved able to demonstrate beats, difference-tones, etc., with unusual distinctness. Spearman's monochord admitted adjustment down to 1/10 v. d.; his æsthesiometer, having a third point at 45° to the normal pair, rendered it possible to apply single stimuli to any surface *perpendicularly* Struycken had constructed a valuable instrument for measuring auditory acuteness in micro-millimeters. Sommer demonstrated a variety of ingenious clinical inventions: one of them, on being attached to the patient's pulse, translated the beats into musical tones whose rhythm varied characteristically with every psychic disturbance; another graphically registered the smallest movement of arm or leg in any direction, and curves thus obtained from patients with dementia præcox, alcoholism, etc., presented in each case readily distinguishable symptoms. Many other useful apparatus, photographs, statistical table, and reports were laid out for inspection.

The proceedings closed by founding a permanent national Psychological Society. C. SPEARMAN.

L'Année psychologique, publié par A. Binet avec la collaboration de H. BEAUNIS, V. HENRI et TH. RIBOT, Vol. X. Paris, Masson et Cie. 1904, Price 15 f.

This volume contains among the other original articles by Prof. Binet: the first, the leading article of the volume, "*La création littéraire*," a psychological portrait of M. Paul Hervieu; a Summary of

the Work Undertaken by the Société de psychologie de l'enfant; On Questions of Cephalometrical Technique; and on Graphology and its indications with regard to sex, age and intelligence. The other original articles are by Lecaillon, on the Biology and Psychology of a Spider (*Chiracanthium cornifex*); by Bourdon and Dide on a Case of Continuous Amnesia with tactile asymbolia, complicated with other troubles; by Larguier des Bancels on Methods of Memorization; by H. Michel on Spencer and Renouvier; and by Zwaademaker on the Sensibility of the Ear to Sounds of Different Pitch. These are followed by the usual sections of general and special reviews and the bibliography for 1903.

The list of original articles above gives some hint of a widening of the field of the *L'Année* of which the editors make more definite announcement in a prepatory note. *L'Année* will publish in future every year or every two years, as may be required, general bibliographical and critical reviews covering literature in fields adjacent to that of psychology, and in carrying out this plan the editors have secured the assistance of the following distinguished savants: For *Cytology*, Henneguay; *Anatomy of the Central Nervous System*, van Schuchten; *Physiology of the Nervous System, etc.*, Fredericq; *Pathology of the Nervous System, etc.*, Grassel and Pitres; *Mental Pathology*, Simon; *Anthropology*, Deniker; *Sociology*, Durkheim; *Criminology*, Lacassagne; *Psychology of Children*, Madam Fuster; *Pedagogy of Normal Children*, Blum; *Pedagogy of Abnormal Children*, Demoor; *Ethics and Philosophy*, Bonnier, Boutroux, Leuba, Molapert, Metchnikoff and Poincaré.

This number though of the usual form and appearance bears the imprint of a new publisher, Masson et Cie, 120 Boulevard Saint Germain, Paris.

Le Comte de Gobineau et l'Aryanisme Historique, par ERNEST SEILLIÈRE. Plon-Nourrit et Cie, Paris, 1903. pp. 450. (La Philosophie de l'Impérialisme, I.)

This is a pious attempt by a discriminating but loyal pupil to sum up the unique views of Count de Gobineau some twenty years after his death. He has prefixed a brief account of his life which he divides into three periods: the theoretical, the Asiatic and the ascetic. In the first he produces his essay on the inequality of the human races which he divides into three: the white, the yellow and the melanian, the former being incalculably superior and who must be served by the other two. Only the Aryans are rapidly developing and of these he seems to think the Germans the best. The impending future solidarity which will reorganize society under Aryan leadership is his goal. In the next period he becomes not only orientalized but almost a mystic and cabalist. The third period was greatly dominated by his relations with Richard Wagner. It would be difficult to say which exerted the greatest influence upon the other. Both co-operated for some time as contributors in the Bayreuth Blaetter.

In Search of a Siberian Klondike as narrated by Washington B. Vanderlip, the chief actor, and herein set forth by Homer B. Hulbert. The Century Co., New York, 1903. pp. 315.

This is a description of an interesting Kamchatkan excursion with dog sledges and various adventures with drifts and blizzards, and has copious illustrations.

La Société Japonaise, par ANDRÉ BELLESSORT. Perrin et Cie, Paris, 1904. pp. 412.

This is a chatty book of a pneumatic writer who has three times

visited Japan and writes in a rather captivating way on the relations of parents to their children, the religious spirit, imagination, on women and love, and on the new society.

On the Threshold of Central Africa, by FRANÇOIS COILLARD. Tr. from French and ed. by Catherine Winkworth Mackintosh. 2d ed. American Tract Society, New York, 1903. pp. 663.

These are simply leaves from pages of a French missionary journal during the last twenty years, describing pioneering among the Barotsi of the upper Zambesi. It is essentially personal narrative and gives a very interesting account of the savages among whom this devoted man labored. While his methods may often be questioned, his sincere interest and devotion to the savages among whom he labored is beyond all praise.

A History of the Colony of Sierra Leone, Western Africa, by J. J. CROOKS. Browne and Nolan, Dublin, 1903. pp. 375.

The author has gone to sources where he could, although the records of the early history of the colony are meagre and the state papers of the last seventy years are not yet open.

China; Past and Present, by EDWARD H. PARKER. E. P. Dutton and Co., New York, 1903. pp. 424.

The author is professor of Chinese in Owens College and writes here a comprehensive book comprising historical and statistical matter, account of the boxers, the religion of China, imperial power, foreigners, mandarin or officials, celestial peculiarities, politics, and the "seamy side" under which he includes punishments, infanticide and slavery.

Au Pays Moï, par MARQUIS DE BARTHÉLEMY. Plon-Nourrit et Cie, Paris, 1904. pp. 255.

The writer made an extensive trip in Cochinchina and Cambodia, especially along the region of the Dgambia mountains. His survey was essentially a military one, but he gives a number of interesting pictures and many characterizations of the people and their customs, especially those of the Mois and the Stiengs.

India; Past and Present, by C. H. FORBES-LINDSAY. Vol. I, pp. 320; Vol. II, pp. 338. H. T. Coates and Co., Philadelphia, 1903.

These volumes are an interesting description of the most salient points and monuments in India by a man who has been connected with this country by birth, and gives an account of its legendary and subsequent historical periods, its customs, manners, etc., all copiously illustrated.

Die Frauen auf Java, von C. H. STRATZ. F. Enke, Stuttgart, 1897. pp. 134.

For more than five years the author was the first gynecologist in Java. Here following the example of his great master, Carl Schroeder, he undertook to do scientific work. He describes native operations, some peculiarities of formation and gives a mass of material which it must be admitted is not all peculiar to Java.

Die Heimat der Indogermanen im lichte der urgeschichtlichen Forschung, von MATTHAEUS MUCH. Hermann Costenoble, Berlin, 1904. pp. 421.

This is a second and enlarged edition which treats of tools and weapons in the early stone age, geometric and colored decorations of pottery, especially spirals, has an interesting chapter on amber, dis-

cusses the great stone graves and caves, has a brief chapter on culture plants, and discusses more at length the dog, sheep, goat, pigs, cattle and horse. The two concluding sections are on race and the geographical and physical constitution of home and its influence upon inhabitants.

The Diary of a Turk, by HALIL HALID. Adam & Charles Black, London, 1903. pp. 269.

This is written by a Turk from the Turkish point of view and with the greatest frankness. The author was born in Angora, Asia Minor, was trained as a child at school and in the harem of which later he gives a very interesting account. Later he went to Constantinople to pursue his studies and selected one of the hundred schools there, choosing at last the profession of law. Among the best chapters in the book are those that describe the school methods, the curriculum of the law school. Until he was nearly through this he spoke no language but his own, but after meeting a few English people, conceived a great desire to visit that country. He became somewhat sympathetic with the Turkey movement and fell somewhat under the Sultan's suspicions, went to England where he remained. The author loves his country but detests the present Sultan and sheds a somewhat lurid light upon his reactionary methods.

Macedonian Folklore, by G F. ABBOTT. University Press, Cambridge, 1903. pp. 372.

The writer under the Prendergast studentship went to the Greek speaking parts of Macedonia and derived his material almost entirely from oral tradition, occasionally supplementing it by local publications and peasant almanacs. He groups his material under folk calendar and seasons, Eastertide, winter festivals, divination, symbolism, birth, marriage, funeral rites, spirits and spells, bird legends, riddles, Alexander and Philip in folk tradition. He has, we think, happily refrained essentially from speculation or to making spiritual excursions into the unknown, although Tyler, Lang, and especially Frazer, to whom the work is dedicated, are his ideals. Some of his matter, especially the songs and poems, are given in Modern Greek.

Great Benin: Its Customs, Art and Horrors, by H. LING ROTH. F. King and Sons, Halifax, 1903. pp. 234 + xxxii.

The writer has made a protracted, personal study of the people of this interesting province and here describes with the aid of two hundred and seventy-five pictures their appearance, customs at birth, marriage and burial, their wars and weapons, trades and industries, foods, animals, medicine, music, games, court life, slavery, inheritance, government, punishments, ordeals, fetiches, kindred observances, etc.

The Land of the Dons, by LEONARD WILLIAMS. Cassell and Co., London, 1902. pp. 398.

The author was long a correspondent of the Times, in Madrid, and has explored many parts of Spain and both loves and understands it. We have nowhere seen so full an account as it exists to-day and as it has been transformed in recent centuries. The author gives a very good account of the people, the customs, industries, and even appends a sketch of Spanish history. He declares that it was generally felt to be an advantage for the Spaniards to lose their provinces, but he can see only a gloomy prospect unless the following reforms are affected: popular education, the suppression of the national lottery, retrenchment of the army and navy, reduction of the pension lists, the sup-

pression of taxation upon food stuffs and the various monopolies, a non-political service, and some settlement of the religious question.

To-day in Syria and Palestine, by WILLIAM E. CURTIS. F. H. Revell Co., Chicago, 1903. pp. 528.

This is an effort to describe the Holy Land and the historical scenes in Syria as they appear to-day to a newspaper reporter. The writer confesses that his trip destroyed many illusions, weakened his confidence in professional teachers of Christianity, confirmed his faith in the Bible and for every spot that could be identified.

Methods and Aims in Archæology, by W. M. FLINDERS PETRIE. Macmillan and Co., London, 1904. pp. 208.

No one, surely, is more competent to treat this theme than the author, and his chapters on the excavators, on discrimination, the laborers, arrangement of work, recording in the field, copying, photographing, preservation of objects, packing, publication, systematic archæology, archæological evidence, ethics of archæology, altogether constitute very interesting reading.

Das Asylrecht der Naturvölker, von A. HELLWIG. R. V. Decker, Berlin, 1903. pp. 122.

This is a valuable contribution by a pupil of Professor Kohler, Berlin, who attempts to gather from all the known races of Australia and the Southern Sea in Africa, all the instances of the rite of asylum whether in time or in place. This involved a study of the rites of hospitality to strangers of all places and conditions where criminals or others might be sure of safety and protection. From his preliminary studies he thinks these rites less among the North American Indians than among other savage people. He has given us an important contribution to primitive ethics and to the anthropology of jurisprudence.

Nervous and Mental Diseases, by ARCHIBALD CHURCH and F. PETERSON. 4th ed., revised. W. B. Saunders, Philadelphia, 1903. pp. 922.

We welcome this thoroughly revised fourth edition, a work throughout abounding in interest to psychologists. The latter, however, will perhaps be especially interested in the nearly forty pages entitled, "A Review of Recent Problems of Psychiatry," by Adolf Meyer, lately docent in Clark University and now director of the Pathological Institute of the New York State Hospital. This exceedingly interesting and valuable survey is largely devoted to the work of Kræpelin, Zihen and Wernicke.

Lehrbuch der Speziellen Psychiatrie für studierende und ärzte, von ALEXANDER PILCZ. Franz Deuticke, Leipzig, 1904. pp. 249.

In the first section the author treats of acute functional insanity under which he includes mania and amentia. Then comes functional, chronic insanity including paranoea, periodic and alcoholic insanity and dementing processes. About twelve pages are given to dementia præcox and a few to thyrogenic insanity. Then follows insanity of the great neuroses, innate defects, partial responsibility.

The Journal of Infectious Diseases. Ed. by Ludvig Hektoen & Edwin O. Jordan. Chicago, 1904. pp. 210.

This is, we believe, the fifth new American publication devoted mainly to the publication of results of research in the field of medicine. The others are the Journal of Experimental Medicine, the American Journal of Physiology, the American Journal of Medical

Research, and the American Journal of Anatomy. These five journals and their content, which are a credit to the medical profession, were made possible by the development of what Professor Barker calls the semi-university schools of medicine where in six or eight of the best centres the first two years' study is devoted to the applications of these sciences to disease, hospital visitation, clinical practice, etc. Most of the work published in these five journals would have been impossible so long as medical professors were also practicing physicians. That so many of those who in the last two years are still so is a just ground of reproach, and until this evil is removed we shall not have real medical schools in the best European sense.

Hirnanatomie und Psychologie, von L. EDINGER. August Hirschwald, Berlin, 1900. pp. 25.

This book is an interesting summary of the present status and recent changes in the study of the brain.

The Neurones and the Neurone Concept considered from the Anatomical, Physiological, Pathological and Psychological Point of View, by WESLEY MILLS. Montreal Medical Journal, December, 1903. pp. 22.

This is a convenient latest attempt to sum up in popular form, with the use of thirty diagrams, the present views concerning neurones. Convenient as it is, it has what we deem the great defect of making no attempt to give the literature upon the subject.

Die Erregung, Hemmung, und Narkose, von N. E. WEDENSKY. Martin Hager, Bonn, 1904. pp. 152.

For a score of years this vigorous thinker has devoted himself largely to the problem which Setchinoff first made prominent, namely inhibition, and here he sums up in a concise way his own conclusions having brought it into formal relation with excitation and narcosis. He has reached the conclusion that narcotic states can be caused by ordinary means of excitation and that these are in turn akin to inhibition. This interesting work needs fuller notice which we hope to be able to give later.

Krystallisation und Morphogenesis, von MORIZ BENEDIKT. Moritz Benedikt, Wien, 1904. pp. 68.

This is chiefly an account of the as yet mostly unpublished researches of the Roman savant Schroen which Benedikt thinks show a connecting link between animate and inanimate nature. Development of energy by slight stimuli is not a specially psychic phenomenon. There is no specific protoplasm. Mineral organization is not entirely different from that of life. Benedikt concludes with a wild speculation about the possibility of living creatures in the sun.

Response in the Living and Non-Living, by JAGADIS CHUNDER BOSE. Longmans, Green & Co., London, 1902. pp. 199.

The author treats here of the mechanical response of living substances to different stimuli, electric response in general, electric response in plants and the method of negative variation, the block method, effects of single stimulus and of superposed stimuli, diphasic variation, the relation between stimulus and response, the influence of temperature, anæsthetics and poisons. The response in metals is then considered together with inorganic response and that in metals generally. The methods of ensuring consistent results, molecular mobility, fatigue, and modified response in inorganic material, the effects of chemical reagents, reactions to light, retinal currents, and

visual analogues, conclude the topics treated. Most of these papers are transformed and edited from the earlier publications of the writer.

The Special Physics of Segmentation as shown by Synthesis, from the standpoint of universally valid dynamic principles, of all the artificial parthenogenetic methods, by E. G. SPAULDING. Reprinted from the *Biological Bulletin*, Vol. VI, No. 3, February, 1904. pp. 97-122.

Einführung in die Experimentelle Entwickelungsgeschichte, von OTTO MAAS. J. F. Bergmann, Wiesbaden, 1903. pp. 203.

Every student of these subjects will heartily welcome an attempt to bring together in order all the various efforts to control development of the early stages of life by the application of chemical, physical, thermal and other methods. The larger part of the work is devoted to the specific, internal factors of development, and the book is copiously illustrated.

Uber die Bedeutung des Darwin'schen Selectionsprincips, von DR. LUDWIG PLATE. 2d ed. W. Englemann, Leipzig, 1903. pp. 247.

The writer first discusses objections to Darwinism that he believes unessential or passé. He then passes, after this introduction, to the essential and genuine objections which he finds to be very many, and finally attempts to sum up the factors of development as they must be apportioned between Darwin, Lamarck, Weismann, Roux, Wallace and others.

The Prevailing Conception of Degeneracy and Degenerate, with a plea for introducing the supplementary terms, deviation and deviate, by G. L. WALTON. Boston Medical and Surgical Journal, Vol. CL, No. 3, pp. 61-63. Jan. 21, 1904.

Walton objects even to the term superior degenerate because it has been associated with rather extreme types of decadence. Many stigmata which he would include under the term deviate, like, for instance, flecks on the iris, different shade of the two eyes, are too slight to be called degenerate.

While there is much to be said in favor of the word deviate neither it nor perhaps any other that can be suggested is sufficient to designate the very many forms of human aberration. For instance, precocity and retardation do not involve deviation from the line of normal development but only acceleration or slowness of progress on it. This the term deviate does not exactly express. Neither does aberrate or variate which has also been suggested. Perhaps abnormal is abstractly the best word, but this, too, has now unpleasant associations as any of the new words would soon have if generally adopted.

Symbol-Psychology; A new interpretation of Race-Traditions. By ADOLPH ROEDER. Harper & Bros., New York, 1903. pp. 204.

This, if we understand it aright, is a very unique book. It selects seven themes from folk-lore and presents a composite or comparative account of the main features of each, and then makes very bold suggestions as to what in the soul or in the history of nature or man in the past they symbolize. The seven themes he selects are the following: the twin-brother story; the man-animal story; the life-token; journeys and wanderings; the captive maiden; gods, heroes, dwarfs, and giants; the architecture of souls. The first question that naturally arises is, "Has the author really found typical story roots from the very many that might be selected, and especially, has he really found his way to the common centre or root?" This being granted, the far greater question of the soundness of his very bold suggestions as to interpretation may well give us pause.

Allgemeine Psychologie, von PAUL NATORP. N. G. Elwert, Marburg, 1904. pp. 63.

This professor of philosophy has favored us with an epitome of his own course of lectures designed, perhaps, primarily for his own students. He begins after the manner of his school with consciousness and the ego and its object, the division of phenomena into physical and psychic, and then discusses a few physiological conceptions like the nervous system, sense organs, etc., passes thence to the concepts, first time and space, after which he discusses association, apperception, attention, and finally ideas. He is in general true to the Herbartian compositions colored, however, by Lotze and Kant.

The Direction of Hair in Animals and Man, by WALTER KIDD. A. & C. Black, London, 1903. pp. 154.

The author seeks to co-ordinate the scattered facts of the direction of hair in the lower animals and man, to interpret most of them upon mechanical principles, and also to supply an answer to the question whether acquired characters can be inherited. He shows in general that the hair streams grow along lines of least resistance, gravity being a rather dominant factor. The author believes that he has demonstrated the fallacy of Weismannism by his studies. Next to gravity underlying and divergent muscular traction and pressure and lines of least resistance are the author's principles of explanation. That the author has explained his facts adequately no one, perhaps not himself, would claim, and it is we think, no less evident that he has been diverted into criticisms of Weismann which mar the unity of his work.

Das Leben im Weltall, von LUDWIG ZEHNDER. J. C. B. Mohr, Tübingen, 1904. pp. 125.

This Professor of Physics in the University of München discusses atomism in general and its relations to ether, heat, sound and light. The second part is devoted to the building up of bodies, aggregate states, molecules, assimilation, fistella and adaptation. The author then treats the methods of life beginning with the simplest, including differentiation, plants and animals, psychic life, races and states. Lastly, the structure of the world, planet systems, comets and eternal circulation, somewhat in the sense of Plato's aeon theory, is discussed.

Die Gesichtspunkte und die Tatsachen der psychophysischen Methodik, von G. E. MUELLER. J. F. Bergmann, Wiesbaden, 1904. pp. 244.

We have here a masterly and perhaps almost epoch-making work, which is also most timely. We regret that our limitations prevent us from giving a more extended account. We can only name a few of the general topics treated to show the scope of the work. Judgments of various forms in experimental processes are first considered, and the necessity of absolute conscientiousness as well as of subjective and objective confirmation. The danger of half scientific processes is well stated. The choice of D's (= differences) and their series is dwelt upon. In the next chapter the determinations of thresholds and their variability are treated with various formulæ and their use, together with elimination of errors, fractioning, absolute and differential thresholds. The relation between S and h is given considerable attention. Next comes the element of absolute impression and all that it implies in the field of the various senses, especially in time; then the modes of treating the judgment numbers, the studies of distraction, average error, limitation, equivalent stimuli, differentiation, etc.

Die Nachahmung und ihre Bedeutung für Psychologie und Völkerkunde, von P. BECK. Hermann Haacke, Leipzig, 1904. pp. 173.

A serious treatise with no index, not even that of chapters, with no italics, no summaries, is, we believe, unless it has peculiar merit, destined to obscurity. There is no way to get into a book like this. To be sure some sections are headed perception, language, imitation, reason, kultus, morality, science. We believe that a book which must be read through before it can be understood what field it covers is doomed to oblivion. We have not time to give a hard day or two's work to find out whether this book is very good or very bad. It seems to be more philosophical than scientific.

La Vision, par J. P. NUEL. (Bibliothèque internationale de psychologie expérimentale, normale et pathologique.) Octave Doin, Paris, 1904. pp. 376.

The writer attempts to summarize the researches of the last few years in this field. The first part discusses vision in animals. The second part, beginning with page 115, treats visions in man. The work does not pretend to be a pioneer work, but is a good summary of the field included, with a bibliography brought up to date. It is well provided with indexes.

Die stammesgeschichtliche Entstehung des Bienenstaates sowie Beiträge zur Lebensweise der solitären u. sozialen Bienen (Hummeln, Meliponinen, etc.), von H. VON BUTTEL-REEPEN. G. Thieme, Leipzig, 1903. pp. 138.

This distinguished author has here expanded a lecture, originally given in 1902, into a little volume in which he describes the methods of animal psychology, the conceptions of instinct, reiterates his views that bees and wasps are not automata. The natural history of the bee the author traces back to several forms of insect ancestry which burrowed and laid their eggs in single holes in the ground. Sometimes these insects were solitary. Later their burrows were somewhat grouped together either in vertical, spiral or other forms. Burrows with two or three branches, nests like those of many ants honeycombed with passages, mud wasps that dig a group of holes together, bumble bees and their well known nests—all these are stages toward the development of the hive and honeycomb. In the second part, entitled Physiology without Biology, the author returns to his controversy with Bethe, and in the end collects a valuable literature of one hundred and ninety-nine titles.

Die Elemente der Musikalischen Æsthetik, von HUGO RIEMANN. W. Spemann, Berlin, 1900. pp. 237.

This work, by a Leipzig docent who is an expert in music, discusses art and music in general, then takes up pitch, timbre, dynamics, the roots of art, scale and harmony, dissonance, tonality, rhythm, motive, imitation, contrast and tone painting.

Grundzüge der allgemeinen Asthetik, von STEPHAN WITASEK. Johann A. Barth, Leipzig, 1904. pp. 410.

This book is the unified product of many contributions of its writer to this subject. He first discusses the problem and methods of æsthetics, its material point of view, and then surveys æsthetic facts, objects, chief types, the state of the subject, the nature of æsthetic enjoyment, pseudo æsthetic factors of enjoyment, the explanation of them, the æsthetic norm, etc., and from this standpoint undertakes to define and describe true art.

Der Ursprung der Kunst. Von YRJÖ HIRN. Johann Ambrosius Barth, Leipzig, 1904. pp. 338.

This is a translation from English into German of this remarkable and well known work by this author.

Versuch einer Stellungnahme zu den Hauptfragen der Kunstphilosophie, I, von K. S. LAURILLA. Helsingfors, 1903. pp. 251.

We have here a very philosophical discussion of art, its idea, its essence and nature, its origins, problem, significance for modern life, and lastly its relations to morality. The writer is evidently a good man and a religious one and few would dispute the general drift of his argument but it may well be doubted whether much of value is added to the subject by so abstract a discussion of it.

Balance, the Fundamental Verity, by ORLANDO J. SMITH. Houghton, Mifflin & Co., Boston, 1904. pp. 146.

This is an honest, well-meant book intended to show the triumph of righting justice in the world, especially that the soul is accountable, that it survives death, and that there is a supreme power that rights things.

The Neighbor, by N. S. SHALER. The Natural History of Human Contacts. Houghton, Mifflin & Co., Boston, 1904. pp. 342.

This, like the two preceding books of the same author, was worth writing and will prove for some worth reading. Like the others it will be also disappointing to those who expect much scholarship in the fields it touches or much novelty in the way of suggestions. It is a strong instinct and no doubt an excellent practice for scientists who have devoted long and laborious years to their department to expatiate on larger general questions. They are generally hard-headed, practical, sensible men and the muse of common sense will always have its votaries. We confess to a little disappointment in reading the writer's treatment of the Hebrew and the African problem. The former is largely historical and it would seem as though his long academic experience and observation might have taught him more of living present interest. That he really adds to our knowledge of the African cannot be said.

L'Individualisme Anarchiste. Max Stirner. Par VICTOR BASCH. Félix Alcan, Paris, 1904. pp. 294.

Max Stirner was born in 1806 and died in 1856. He was in youth a pupil of Hegel and after taking his degree became teacher in a girls' high school in Berlin. Here, in 1844, he wrote his remarkable book entitled "Das Ich und sein Eigenthum." In this he carried the affirmation of individualism and even selfishness to its utmost extreme as against Hegelism which subordinates persons to movements of the Zeit Geist. This book produced considerable sensation, but its advocacy of extreme and selfish egoism unsettled the author. He had to resign his position and thenceforth lived in squalor doing hack work. His second wife, also an extreme socialist and from whom he was divorced and who lived on till 1896 in London, is said to have sunk very low. Stirner would have been almost forgotten had it not been for the interest in Nietzsche of whom he is called one of the precursors. This prompted John Henry MacKay to write Stirner's life and it also prompted this book.

Die Familie, von W. H. RIEHL. 12th ed. T. G. Cotta, Berlin, 1904. pp. 321.

This prolific author here publishes the twelfth edition of his work.

It is divided into two parts, the first treating man and woman, and the second, home and family.

Ethik als Kulturphilosophie, von PAUL BERGEMANN. Theodor Hofmann, Leipzig, 1904. pp. 639.

This book treats first of the development of the moral consciousness in the history and deeds of mankind, while the second part is devoted to ethics as a culture philosophy. The author claims that moral consciousness is unique and that his way of treating the problem, sources, and method makes ethics scientific. Considerable space is given to the matriarchie and to patriarchal systems, and one long chapter gives a good account of the history of the philosophy of ethics from Greece down. One of the bases of morals is sociopsychological.

The Neo-Platonists: A study in the history of Hellenism, by THOMAS WHITTAKER. University Press, Cambridge, 1901. pp. 231.

This volume appears to be an admirable study from first hand sources of the system of Plotinus, and those most closely related to him. Sections each are given to Porphyry, Iamblichus, and Proclus. The author rates the historic importance of Neo-Platonism very high.

La Philosophie en Amérique depuis les origines jusqu'a nos jours (1607-1900), par L. VAN BECELAERE. Electric Publishing Co., New York, 1904. pp. 180.

We have here, at last, an attempt to write a comprehensive history of philosophy in America for three centuries down to the present. It is a bold and somewhat ambitious attempt but one that must be called singularly successful. Quite a number of triolet surveys from various standpoints and covering limited periods have been attempted within the last score of years. These the author utilizes to the full and has presented, on the whole, an admirable survey. He first discusses the American spirit in its relations to speculative thought, then treats the colonial period, the Scotch and German influence, contemporary schools, idealists, the philosophy of evolution, psychology, with a final chapter on the present hour. It is dedicated to the Honorable William T. Harris, and introduced by a nine-page article by Professor Royce. It is, of course, easy for those who have followed the course of events in this field for a score of years to find defects and omissions and, of course, no one could entirely agree with any one else's verdict either implied or expressed about any contemporary matters or persons. The form of the book is not attractive and its serviceableness is seriously handicapped by the lack of an index. Neither can we understand why the author, writing on American philosophy, has not put his historic essay in English into which language it certainly ought to be speedily rendered. He has, however, placed every one interested in these subjects under special obligation and it cannot fail to set things in a wider perspective and give us all broader and more historic views of our own work. It is singular that it should be left for a new comer in this country to do this work, but no less singular that it has been done so well.

Das Idealistische Argument in der Kritik des Materialismus, von M. WARTENBERG. Johann A. Barth, Leipzig, 1904. pp. 72.

The author attempts to prove that epistemological idealism can decide nothing as to the justification of materialism; that is, that it can never refute this, but he attempts a vigorous criticism of materialism on other grounds. To successfully refute it one must neither begin with nor lay much stress upon epistemology.

Sulla Filosofia Monistica in Italia. Introduzione del Prof. Enrico Morselli. Unione Tipografico-Editrice, Torino, 1904. pp. xliii.

The monistic philosophy has had an extraordinary career not only in the last two or three decades, but ever since Bruno, in Italy. This career to owes, no doubt, essentially to reaction from the Catholic church. This convenient introduction with its voluminous literature is a good open sesame to the study of this development.

Die Metaphysik Benekes, von ALBRECHT WANDSCHNEIDER. Ernst Siegfried Mittler und Sohn, Berlin, 1903. pp. 155.

It is a very useful service which this adept has rendered students of philosophy in summing up the never entirely harmonized and co-ordinated metaphysical views of Beneke. This he does conveniently with the captions, problem and method of metaphysics, origin of concepts, their relations to being, the forms of the latter, and religious philosophy. In the final chapter the author expresses his own profound appreciation of the unique metaphysical views of Beneke.

The Categories, by JAMES HUTCHINSON STIRLING. Oliver & Boyd, Edinburgh, 1903. pp. 158.

In this little book the author breaks a philosophy science of years and indicates the lines of his own active thought since the publication of his famous "Secret of Hegel" nearly a quarter of a century ago. That his devotion to Hegel has not waned is plain from the second chapter. The chapter entitled "Religion and the Categories" is perhaps, on the whole, the most suggestive. It is an interesting book, but we still profoundly need an historical treatise on this subject.

Descartes, Spinoza and the New Philosophy, by JAMES IVERACH. T. & T. Clark, Edinburgh, 1904. pp. 245.

This work gives a very good picture of Descartes and Spinoza. It first discusses the Middle Ages and its problems and then describes how Descartes grew discontented with the knowledge of his age. He criticises the *cogito, ergo sum* and also the arguments for the existence of God. Spinoza is treated in a somewhat similar way, and the two philosophers are compared.

Deutsche und aufserdeutsche Philosophie der letzten Jahrzehnte dargestellt und beurteilt, von DR. J. BAUMANN. F. A. Perthes, Gotha, 1903. pp. 533.

The writer attempts to give us a brief sketch of the views of many leading thinkers of the last ten years. Those to whom the most space is given are Hartmann, Wundt, Eucken, Mock, Nietzsche, Rickert, Ostwald, who has most space of all, Riehl, Spencer, Green, Bradley, Taine, Ribot, Renouvier, Foullier, but many others are treated including James.

Moderne Philosophen, von M. KRONENBERG. C. H. Beck, München, 1899. pp. 221.

These five essays, with the exception of that on Ludwig Feuerbach, have appeared previously. One chapter each is given to Hermann Lotze, Fr. Alb. Lange, Victor Cousin, Ludwig Feuerbach, and Max Stirner.

Zur Einführung in die Philosophie der Gegenwart, von ALOIS RIEHL. B. G. Teubner, Leipzig, 1903. pp. 258.

The topics here treated are the essence and development of philosophy in antiquity, modern philosophy and its relations to exact science, critical philosophy, the bases of knowledge, natural science and philosophical monism, the problem of *Lebensanschauung*, Schopenhauer and Nietzsche, the present and future of philosophy.

Geistige Strömungen der Gegenwart, von RUDOLF EUCKEN. Veit & Comp. Leipzig, 1908. pp. 398.

This fecund philosopher here greatly amplifies an earlier publication of his which is here presented as the third edition. In it he tells what is the fundamental idea of mental life subjectively, objectively, theoretically, practically, etc. He discusses idealism, realism, problems of knowledge, of the world, of human life, history, society, art, morals, personality, character, freedom of the will, and finally religion. His fundamental idea of the higher spiritual world demonstrated by immediate intuition pervades this as all his other writings.

The Pathway to Reality, by RICHARD BURDON HALDANE. John Murray, London, 1904. pp. 275.

All who are not experts will thank the author for giving us in eleven pages an epitome of these lectures to which he appends a survey of the ground covered in the twenty Gifford Lectures now given. The first book in this volume is devoted to absolute mind, and the second to finite mind.

Geschlecht und Kinderliebe, von DR. P. J. MÖBIUS. Carl Marhold, Halle, 1904. pp. 72.

This pamphlet sets forth the difference in the feelings of the two sexes toward children, and contains thirty-seven cuts of skulls of birds and animals illustrating sex differences. Much space is given to discussing the doctrines of Gall.

Science de l'Homme et Méthode Anthropologique, par ALPHONSE CELS. Felix Alcan, Paris, 1904. pp. 453.

In this hand book we have an exeedingly comprehensive if not very intensive or detailed account of Anthropology, its methods, its matter. It includes the organization of human nature, the unity of our race, life and vital force in man, mesology, the laws of the body, of the soul and the spirit, the relations of men and women, family, etc. So general a work cannot entirely escape the charge of being superficial.

Twentieth Annual Report of the Bureau of American Ethnology to the Secretary of the Smithsonian Institution. 1898-1899. By J. W. POWELL. Government Printing Office, Washington, 1903. pp. 237.

Besides the Director's report of 224 pages, attempting to cover the entire world of learning and which is certainly very curious in some of its sections, the chief content of the volume is a very copiously illustrated article of 237 pages on aboriginal pottery of eastern United States by W. H. Holmes. As in so many of the reports of this bureau the cuts occupy more space than the text itself.

Betrachtungen ueber das Wesen der Lebenserscheinugen, von PROF. R. NEUMEISTER, 1903. pp. 107.

The author argues that despite all the assertions (and in the nature of the case they can be nothing more) of the mechanists there remains a transcendent problem. Physiology has done nothing hitherto to explain the real nature of vital processes. Many relations and sequences have been established but not one of even the simplest problems of life have been elucidated. Justly discredited as was the old vitalism something like another purposive agency must be assumed.

Studies in Voluntary Muscular Contraction, by THOMAS ANDREW STOREY. University Press, Stanford University, California, 1904. pp. 62.

This is a very careful study of years of evidence derived from both

individual and group studies all of which point harmoniously to an increasing period of morning ability until ten or eleven or later and then fall, with an afternoon rise until three or four and fall at six, with an early evening rise and fall at nine or ten. Thus this would seem a normal variation in the power of muscles to do work and it is about the same whether the power is called forth by electrical or by voluntary stimulus.

The Journal of Philosophy, Psychology and Scientific Methods. Vol. I, No. 4, February 18, 1904. The Science Press, Lancaster, Pa. pp. 85-112.

We welcome and bid hearty godspeed to the new Journal of Philosophy, Psychology and Scientific Methods, edited by Professor J. E. Woodbridge of Columbia. It is a valuable addition to the arsenal of resources for all who teach these subjects. We sincerely wish, however, that the notes and book reviews might be fuller and more numerous.

A Method for the Identification of Pure Organic Compounds, by SAMUEL PARSONS MULLIKEN. John Wiley & Sons, New York, 1904. Vol. I, pp. 264.

This first volume contains classified descriptions of about twenty-three thousand of the more important compounds of carbon with hydrogen and with hydrogen and oxygen. The book is certainly admirably gotten up and is very impressively technical, consisting very largely of tables.

Die Grenzen der Geschichte, von F. GOTTL. Leipzig, 1904. pp. 142.

History and thought are "protuberances of a deeper content of ideas." History interprets being to get at what has happened. Historical geology interprets what has happened in order to get at being. All else is matahistorical. History must be emancipated from natural history.

Man's Place in the Cosmos and other essays, by A. SETH PRINGLE-PATTISON. Wm. Blackwood & Sons, Edinburgh, 1902. pp. 319.

These are various essays, the first giving the title to the book. The others discuss the present position of the philosophical sciences, the new psychology and automatism, a new theory of the absolute, Balfour, Nietzsche, the venture of theism.

The University of Colorado Studies. Vol. I, No. 4. Univ. of Colo., Boulder, Colo., February, 1904.

This series of studies, established by the late Arthur Allin, contains what is probably his last paper. It is on laughter, and gathers up the data collected and the work done since the paper of Hall and Allin six years ago.

Grundzüge der Physiologischen Psychologie, von WILHELM WUNDT. Wilhelm Engelmann, Leipzig, 1903. pp. 133.

W. Wirth, a private docent and assistant in Wundt's laboratory, has here given us an elaborate topical and personal index to Wundt's last three-volume edition of his psychology.

Proceedings of the Society for Psychical Research. Part XLVII, Vol. XVIII, January, 1904. R. Brimley Johnson, London, 1904. pp. 103-322.

The chief article is on the phenomena of Mrs. Thompson's trances, with a brief article on certain unusual psychical phenomena, by John Honeyman.

An Establishment of Association in Hermit Crabs (Eupagurus Longicarpus), by E. G. SPAULDING. Reprinted from the *Journal of Comparative Neurology and Psychology*, Vol. XIV, No. 1, Larch, 1904. pp. 49-61.

Theorie der Beobachtungsfehler, by EMANUEL CZUBER. B. G. Teubner, Leipzig, 1891. pp. 418.

Recherches Algésimétriques, par J. IOTEKYO et M. STEFANOWSKA. (Laboratoire psychologique Kasimir, Université de Bruxelles.) Bruxelles, 1903. pp. 86.

Rapport Quinquennal (1898-1903) *sur les travaux du Laboratoire Psychologique Kasimir*, par MLLE. J. IOTEVKO. Hayez, Bruxelles, 1903. pp. 20.

The Journal of Logic. Vol. 1, No. 1, June, 1904. S. S. Hebberd, Chesterfield, Ill. pp. 39.

Problems in Astrophysics, by AGNES M. CLERKE. Adam & Charles Black, London, 1903. pp. 567.

A History of Dancing from the Earliest Ages to Our Own Times, from the French of Gasto Vuillier, with a Sketch of Dancing in England, by JOSEPH GREGO. D. Appleton and Co., New York, 1898. pp. 446.

A Study in Reaction Time and Movement, by THOMAS V. MOORE. *Psy. Rev.* Monograph Supplement, Vol. 6, No. 1, April, 1904. pp. 86.

The Rhythm of Immunity and Susceptibility of Fertilized Sea-Urchin Eggs to Ether, to HCl, and to Some Salts, by E. G. SPAULDING. Reprinted from the *Biological Bulletin*, Vol. VI, No. 5, April, 1904. pp. 224-240.

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NOTES.

British Medical Association.

The seventy-second annual meeting of the British Medical Association is to be held at Oxford, July 26-29. In connection with Section E, Psychological Medicine, the following discussions have been arranged:

July 27. Criminal Responsibility and Degeneracy, introduced by Dr. Chas. A. Mercier. Dr. Max Nordau will take part in the discussion.

July 28. Heredity, introduced by Medizinalrat Dr. W. Koenig, of Dalldorf Asylum, Berlin (psychiatrical aspect), and Dr. J. Beard (biological aspect).

July 29. Dementia præcox, introduced by Dr. C. Norman.

Congress of Philosophy.

The second international Congress of Philosophy will be held at Geneva, September 4-8, 1904. The Congress will meet in five sections: History of Philosophy, General Philosophy and Psychology, Applied Philosophy (ethics, æsthetics, social philosophy, philosophy of religion, philosophy of law), Logic and the Philosophy of the Sciences, History of Science. The card of membership costs 20 francs; the official languages of the Congress are English, French, German and Italian. All communications should be addressed to M. le Dr. E. Claparéde, 11 Champel, Geneva, Switzerland.

St. Louis Congress of Arts and Science.

The revised programme (June 20, 1904) of the International Congress of Arts and Science, to be held at the Universal Exposition, St. Louis, Sept. 19-25, contains the following:

Division of Mental Science.

Speaker. President G. Stanley Hall, Clark University, Worcester, Mass.

Department of Psychology.

Chairman. Professor Noah K. Davis, University of Virginia.
Speakers. Professor J. Mark Baldwin, Johns Hopkins University, Professor J. McK. Cattell, Columbia University.

Section A. General Psychology.

Chairman. Professor Chas. A. Strong, Columbia University.
Speakers. Professor Harald Hœffding, University of Copenhagen, Professor James Ward, University of Cambridge.

Section B. Experimental Psychology.

Chairman. Professor Edward A. Pace, Catholic University of America.

Speakers. Professor Hermann Ebbinghaus, University of Breslau, Professor E. Bradford Titchener, Cornell University.

SECTION C. COMPARATIVE AND GENETIC PSYCHOLOGY.

Chairman. Professor Edmund C. Sanford, Clark University.
Speakers. Principal C. Lloyd Morgan, University College, Bristol, Professor Mary Whiton Calkins, Wellesley College.

SECTION D. ABNORMAL PSYCHOLOGY.

Chairman. Professor M. Allen Starr, Columbia University.
Speakers. Dr. Pierre Janet, Sorbonne, Paris, Dr. Morton Prince, Boston, Mass.

GERMAN CONGRESS OF EXPERIMENTAL PSYCHOLOGY.

A Congress of Experimental Psychology, was held at Giessen, April 18-21, under the presidency of Professor G. E. Mueller of Gœttingen. The Congress resulted in the formation of a Society for Experimental Psychology, which has decided to hold a second meeting at Wuerzburg in the Easter vacation of 1906. Intending members should communicate with the Secretary of the Society, Dr. F. Schumann, Berlin N. W., Dorotheenstrasse 95/96 III; the yearly subscription is Mk. 5. Professor Sommer, of Giessen, has published (Leipzig, A. Barth) a pamphlet entitled Die Ausstellung von experimentall-psychologischen Apparaten und Methoden bei dem Kongress für experimentelle Psychologie, which contains useful information and a large number of figures (pp. 78; price Mk. 2.40).